In This Issue—*Another Business Fable in Slang*

Engineering Library

MAY 6 1922

MOTOR AGE

Volume XLI
Number 18

PUBLISHED WEEKLY AT THE MALLERS BUILDING
CHICAGO, MAY 4, 1922

Thirty-Five Cents a Copy
Three Dollars a Year

Entered as second class matter Sept. 19, 1899, at the post office at Chicago, Ill., under Act of Mar. 3, 1879

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"With the Pistol Grip and Trigger Switch"

$45.00

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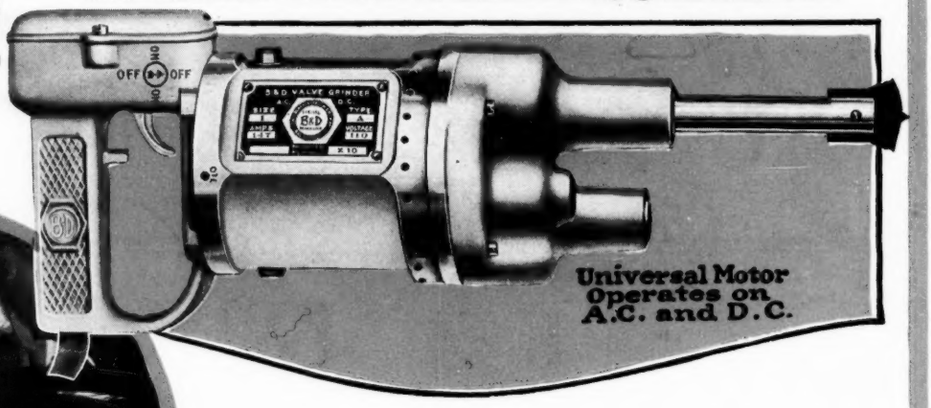
8 POUNDS



IF an eight cylinder car requires one man's labor for five hours to perform the actual grinding operation and he charges his customer $1.25 per hour he will have to charge $6.25 for the grinding work.

As the Black & Decker Electric Valve Grinder performs the work more than four times as fast as it can be done by hand, the same man can grind the valves on at least four eight cylinder motors in the same length of time (5 hours.)

Instead of charging your customer $6.25 for each grinding job, which is what you would have to charge him, if the work was done by hand, at the rate of $1.25 per hour, by using the Black & Decker Electric Valve Grinder, you can establish a flat rate of $5.00 for the actual valve grinding operation on an eight cylinder motor, and you will receive $20.00 for five hours work instead of $6.25, but you will at the same time be saving your customer $1.25 on the job.

At this rate you can see that the Black & Decker Electric Valve Grinder, which costs you $45.00, can be made pay for itself in about fifteen grinding jobs.

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MOTOR AGE

Published Every Thursday by
THE CLASS JOURNAL COMPANY
MALLERS BUILDING
59 East Madison Street, CHICAGO

Vol. XLI CHICAGO, MAY 4, 1922 No. 18

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SUBSCRIPTION RATES

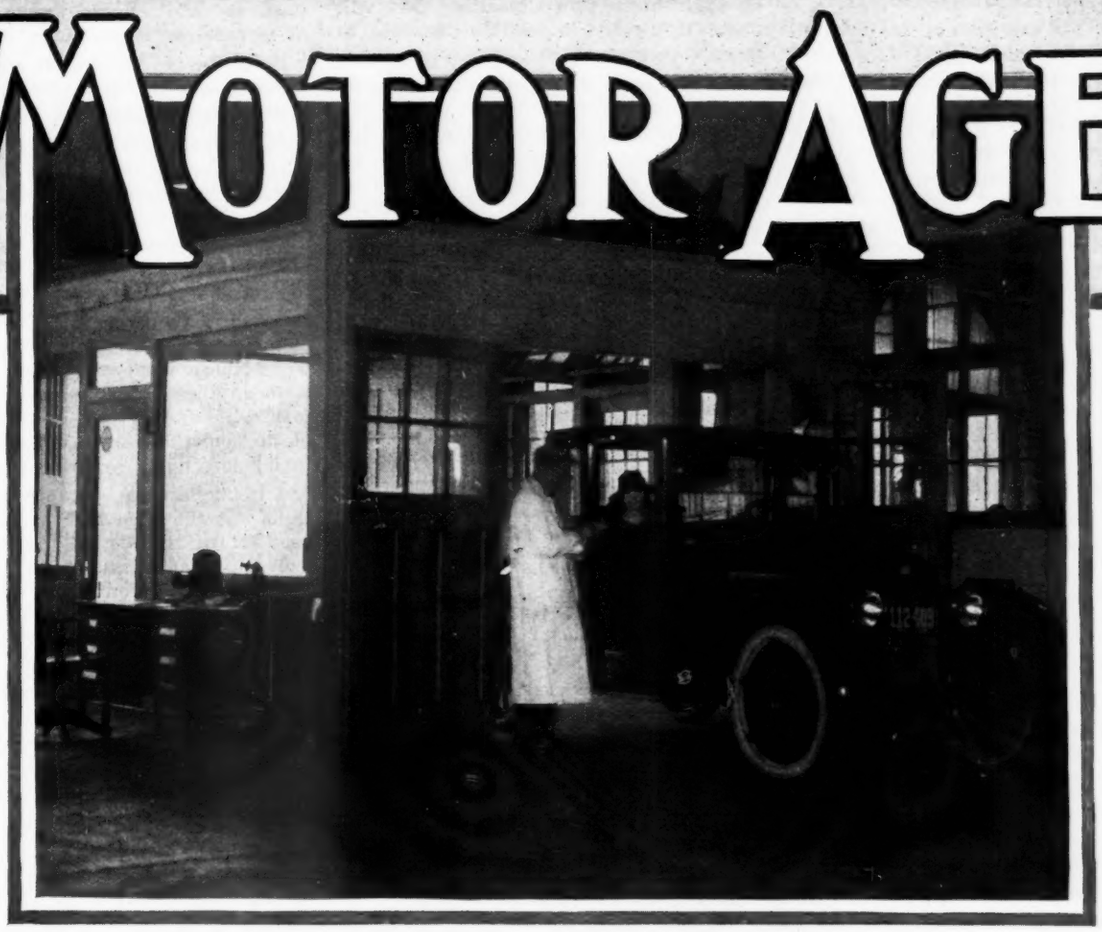
United States, Mexico and U. S. Possessions	$ 3.00 per year
Canada	5.00 per year
All Other Countries in Postal Union	6.00 per year
Single Copies	35 cents

Subscriptions accepted only from the Automotive Trade

Entered as Second Class Matter Sept. 19, 1899, at the Post Office at Chicago, Ill., under Act of March 6, 1879.

VOL. XLI, No. 18 CHICAGO, MAY 4, 1922 $3.00 Per Year

MOTOR AGE



The receiving of the customer in the maintenance department is all important. If the customer is met by a greasy mechanic or steps out of the car onto a dirty floor strewn with tools and parts he is apt to judge the kind of job he is going to get from the surroundings. Imagine the faith a customer must have in the quality of work turned out when met in a dignified manner as shown above. This picture was taken in the maintenance department of the Vesper-Buick Auto Co., St. Louis.

WHAT THE DEALER IN THE SMALL TOWN CAN *Learn from the Vesper-Buick Method of* MERCHANDISING MAINTENANCE

The Same Principles for Making Maintenance Pay Apply to Both the Small and Large Institution

By B. M. IKERT

WE have tried to point out in these columns at various times that the selling of maintenance or service on motor cars is pretty much the same proposition regardless of whether it is done in a city of a million, or town of a thousand people. Volume of business is about the only thing wherein the job differs and even here we find exceptions, because you sometimes will find a dealer in a small town with an organization and volume of business that rivals that of his brother dealer operating in the big city.

Two weeks ago there appeared an article in this publication on making maintenance pay on limited volume. This article was directed primarily, of course, to the dealer located in the small town and told of some of the things which he might use to advantage in his business which are now being used by a dealer operating a large maintenance institution in a midwestern city.

Last week we told about the excellent manner in which the Vesper-Buick Auto Co., St. Louis, merchandised its maintenance. We feel there are certain things done by this organization which might well be followed out by any dealer's maintenance department, regardless of

its size or the community in which it is located.

Summing up the salient features in connection with the Vesper-Buick company's maintenance division, we find that there are ten items applicable in a varying degree to the small town dealer's business. These ten are:

1—Receiving of the customer.
2—Equipment to serve.
3—Cleanliness of building.
4—Convenient arrangements for customer.
5—Departmentizing of shop.
6—Inspector, who represents customer.
7—Daily shop record.
8—Eliminating shop losses.
9—General appearance of the place.
10—Advertising.

In regard to the receiving of the customer we can see no reason why a customer should not receive much the same treatment in any other organization as he does in this one. True, the small organization may not be able to afford a man sitting at a desk in the doorway to greet every customer as he comes in, but the spirit of this easily might prevail in any small organization.

Stop any car owner and ask him if he ever has had the experience of going into a maintenance establishment and not finding anyone to direct him or ascertain his wants, until he finally drove out or nosed around several cars and pried out a mechanic from under one of them, only to be told that "you'll have ter see der boss in da office."

It is this sort of treatment that hurts and goes against your grain. It happens usually in the small organization. We pointed out last week how the customer stops his car at the point where the maintenance salesman is located and that the latter greets him almost before he can get out of his car. Now, the majority of car owners, we believe, are pretty sensible people and do not expect the impossible in the small maintenance organization. They know that the personnel cannot be as elaborate as in the larger organization. But they do know that the customer has certain inherent rights and one of these is the right of recognition. The dealer who tolerates conditions in his place of business whereby the customer must wander around in search for someone to take care of his wants, is the one largely responsible for the phrase we frequently hear from the motorist: "The car is all right, but their service is rotten."

Now, what might a dealer in the small town do to make sure his customers get virtually the same attention as those in the Vesper-Buick company upon their arrival? Let him try this:

Suppose he has, say, half a dozen men working in the place and one of these men is the foreman, maintenance manager, or whatever title he wishes to place upon him. In a small shop this man will probably have to do some of the actual work on cars. But don't let him do the work which a boy might do, and so place himself in a position that will make it utterly impossible for him to meet a customer.

Let the foreman or head mechanic, as the case may be, be one who does not have to get down into the grease in his work. He might be used to do all the trouble shooting and final inspection of the jobs, which makes it possible for him to wear clean overalls, or a linen coat. He should supervise all machine work. Still, he must be in a position to watch the approach of a customer.

Should he be out testing a car he must appoint an assistant who, the minute a customer drives in, should step up and announce the fact that Mr. So and So, the foreman is out testing a car, but will be back in a few moments. Under no circumstances should the customer be permitted to wait until the foreman comes back before some one talks with him.

In the Vesper-Buick company's maintenance division, the people who come into contact with the customer are neatly dressed. This point is too often ignored in the smaller organization. A man who talks to a customer and who is neatly attired, shaved and talks pleasantly is far more apt to convince a customer than the man in greasy clothes, unshaved and who snaps out his words, or is careless in his talk.

By properly splitting the work between the men in the shop it is possible for every small organization to put itself on a basis whereby there is every assurance that the customer will be properly received. Especially is it necessary to do this with the new customer. In a small town where everybody knows everybody else, the dealer might get away with a lot of things which could not be attempted in the large city. Thus, the old customers, will know just how to act when there happens to be no one to wait on them upon arrival. They may josh with one or two of the mechanics or do something else, but the new customer does not. He is looking for someone to fix him up, because he probably thinks at the time that he has the biggest lot of trouble of any kind in the world. When a customer, especially a new one, has trouble of any kind he wants to talk it over with some one badly and if that some one is not on deck he gets worried still more.

The Equipment to Serve

The Vesper-Buick organization told us that it was its belief that the successful way in which it was able to handle its business was due largely to its ability to serve. In other words, it equipped for it and now is cashing in on the equipment. By equipment we mean the building, personnel, machinery, system and methods, etc., because all of these things must be included in some form in the successful conclusion of any maintenance operation.

Some years ago "curb-stone" dealers sold many cars but they passed out of existence because they overlooked the great factor of maintenance on the cars they had sold. Some of them, it is true, made arrangements with a certain "garage" to handle the repair work of customers to whom they had sold cars, but naturally if the garage was busy with other work at the time the customer came in he simply had to wait. He could not get service when he wanted it and needed it. Consequently when he again considered buying a car he looked for the dealer who was well established in his community and who could sell him service and maintenance.

Nowadays, when you read the newspaper ads of motor cars, particularly the ads of dealers in local newspapers, you almost always find some mention of the ability of the dealer to sell maintenance on the car he is handling. It is common to have dealers tell you that the reason customers keep buying cars from them is because of their service facilities. There are dealers who have succeeded in handling a relatively inferior car, because of the fact they were able to sell service on that car. Conversely there have been dealers who

Service to the New Car Owner

WHAT of the man who has just bought a new car from you? What sort of service does he expect from your organization? How do you know he will buy another car from you? You want his future business, of course, but are you doing the things now which you know will insure your getting his business next year and the next?

Maintenance work on motor cars does not mean just seeing to it that the man who happens to drive into your place with an engine out of tune that you may remedy the trouble in the engine. You must do more. You must retain the faith he has placed in your organization when he bought the car from you.

Right at this time of the year dealers are selling cars in greater quantities than at other times. Some of these cars are going to customers who have been such for many years and probably will continue to be such because they have been sold on the ability of the dealer to sell them the right kind of maintenance. The continuation of such a customer's good will is an asset which cannot be measured in dollars and cents. But just as important is the securing of the new customer's good will when he has been sold a car. His first few experiences in your maintenance department will largely be the deciding factor as to whether he will buy his next car from you.

failed with an excellent car, because they did not sell service intelligently.

If the small town dealer has the correct conception of maintenance selling, he will not go wrong because, like the Vesper-Buick company, he will take the necessary steps to see that his place of business is equipped to serve.

It does not mean the buying of every piece of labor-saving machinery on the market, nor the installation of an elaborate and complicated system of keeping records. No. It means he will do the things he knows he ought to do. He will not try to get along without the apparatus he knows will allow him to do better work and in less time with a limited number of men.

Though his shop may be small he will systematize it. All of us have been impressed by the "waffle parlors" in the larger cities, wherein we find the kitchen placed in the window instead of at the rear of the building as is generally the case in a large restaurant. Yet you probably will get better service in the waffle parlor than you will in some so-called high class retaurants. The waffle parlor, though small, has equipped to serve and it does it in a way satisfactory to the customer.

There is a vast difference, we agree, in selling waffles and maintenance on motor cars, but what we wish to impress here is that because an institution is small is no reason why it cannot equip to serve as well as an institution many times larger and handling a greater volume of business.

Cleanliness

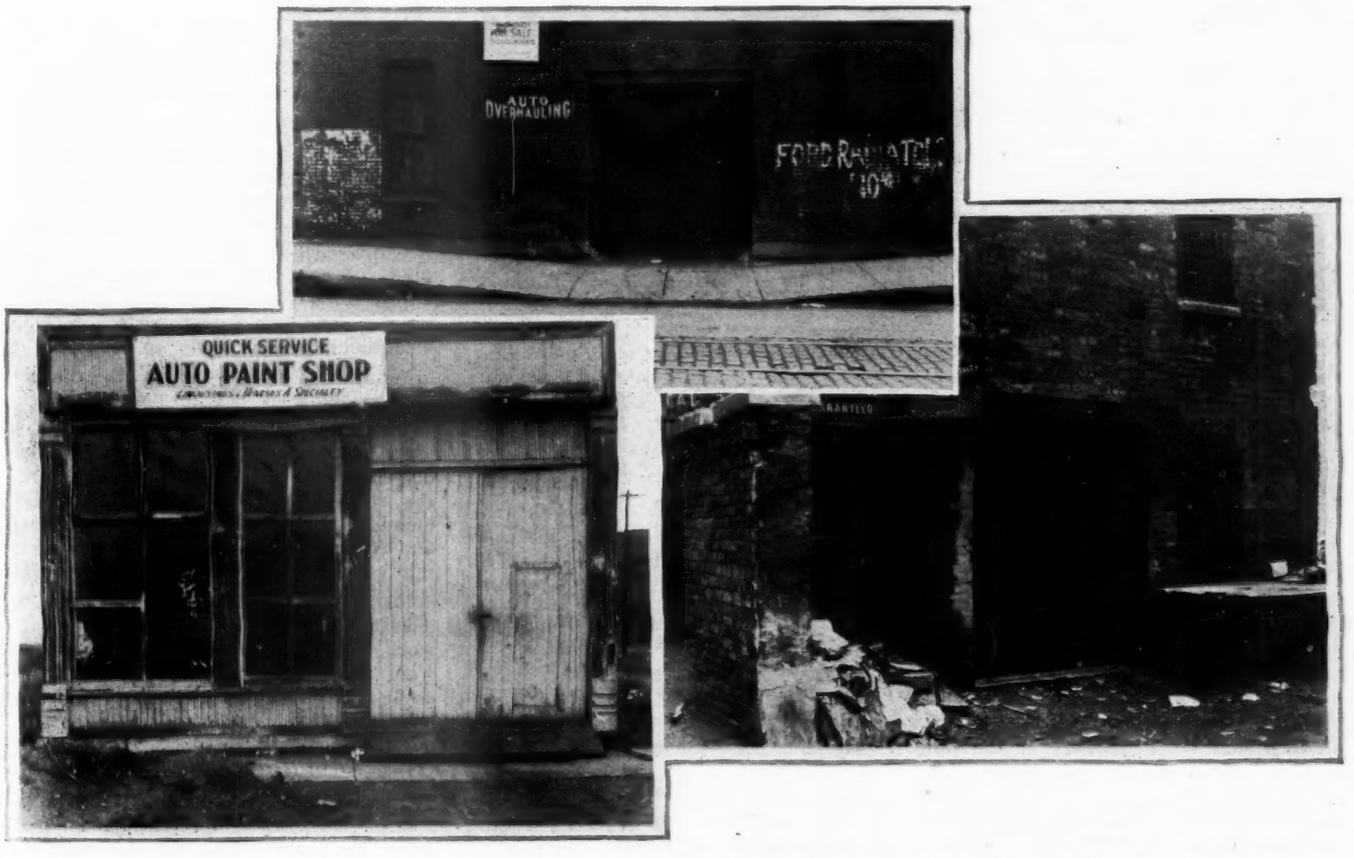
Now comes the cleanliness of the building. A large organization like the Vesper-Buick can afford to hire one or two men whose sole duty it is to keep the place clean and looking trim. The small organization generally cannot afford such a man, but it can afford to have one of the men act in such a capacity in connection with his regular work. If every dealer could visit the Vesper-Buick maintenance building and see the cleanliness all around, we feel sure they would go back to their establishments and invest in a few cans of Old Dutch Cleanser, brooms, mops, window washers, sponges, etc., and put the whole shop crew to work cleaning up the place. If you have any doubts as to where to begin the work let your wife come down and look the place over. She is used to house cleaning and we dare say can give some valuable suggestions as to how to tidy up the place.

Grease and dirt will collect on a motor car and they will find their way into the maintenance department, but they should not be allowed to accumulate there. Certainly the customer should not be brought into contact with them, no more than he is brought into contact with the garbage of the kitchen in a restaurant. Cleanliness is the cheapest thing any dealer can have about his place and to disregard it is simply helping to put him into the class of "just another garage."

Convenient Arrangement

The ground plan of the Vesper-Buick maintenance building printed in last week's issue offers to the small dealer a good chance for studying the selling of maintenance on a large scale, with a view towards establishing some of the features in his own organization. Ground plans will vary in nearly every case and local problems will have to be solved which the dealer knows more about than we do.

In the plan shown last week it was pointed out that the customer has but a short route to follow when he drives into the building of the Vesper-Buick company. All of his transactions with the organization can be carried on in a confined space, because the service salesman's desk, the office, the service



Those who expect to make maintenance pay must get away from conditions like those shown above. How do you suppose a customer with a $2,000 automobile feels if he takes it to one of these places to be "overhauled?" Is there anything in these pictures that would suggest that the men in these shops are used to working to a half-thousandths of an inch? A shop may be small and yet turn out excellent work, but there can be no justification for conditions like those shown.

manager, the parts department, cashier's window, etc., all have been located at one point, so to speak. This makes it unnecessary for the customer to go from one department to another.

Many of the small town dealers might well rearrange their present layout to get more convenience for the customer, and what generally is the case from such a procedure, make it easier to handle the work. We have seen rearrangements made whereby it was possible for a girl bookkeeper also to sell accessories and wait on customers in general. This was in a town of about 1000 people, but the point is this:

Before the change was made the girl took care of the accounting only. When a man expressed a desire to buy an accessory, usually some one from the shop would have to sell him. The same was true of a customer paying a bill. He usually had to take it up with the shop foreman, who went into the office and took care of the matter. Then the dealer conceived the idea of letting the girl handle all bills and to that end cut a window in a wall so that a customer would not have to walk into the office or see the foreman.

He simply was asked to please pay the cashier and a sign over the window showed him where this was to be done. At the same time the girl could watch the salesroom and accessory counter. A little coaching on what the different accessories were easily made her a good enough saleslady so she could handle this end of the business. Thus it will be seen how a dealer in a small town made it easier for his customers to do business and also made it more profitable to himself in the time saved, if in no other way.

Departmentizing Shop

It is getting to be more and more the custom even in the smaller shops for the mechanics to specialize on certain work. One man may be a crackerjack engine man and be practically worthless on electrical work, and so on. Hence, we find today most shops departmentized. This is the case in the Vesper-Buick organization and is applicable on a smaller scale to the small town shop.

What the small shop can learn from the large shop is not to allow a high class mechanic to do the work which a 14-year-old boy can do equally as well. We refer to the cleaning of parts before they are worked upon. All parts must be cleaned before the wear in them can be ascertained, but this sort of work should not be done by a skilled man. In restaurants you find boys who place the silverware, water glasses, butter pads, etc., on the tables, because they can do it as well as the waiter, who looks after the more important work of serving the food. The boys merely get things ready for the waiter. In the same way a boy might get a job ready for the machine.

Another institution which professes to do all kinds of automobile maintenance work. Here again no attempt has been made at housecleaning, nor at making the place inviting to customers. Many a tidy blacksmith shop is far more appealing than this place, a place where they pretend to do good work on a piece of machinery costing hundreds of dollars.

The Inspector—Customer

For want of a better title we must label him as such. He is one of the most important men in the Vesper-Buick organization. If he is not pleased with a job, the customer will not be pleased. On the other hand, if he pronounces a job O. K., the chances are the customer will drive away happy with his car.

Now, every small town organization which sells maintenance and repair work can have such a man in its make-up. He may be the dealer, the shop foreman, or head mechanic. It certainly should be some one's job to act the part of the customer and either accept or reject the work which has been done. If there is a daub of grease on a fender is he going to like it? Not much. Can't one of your men act as the customer and see that the grease is wiped off? Easily.

Every job of any importance should be checked over by some one other than the man who did the work. The inspector can tell from the shop order what was to be done and if he puts himself in the shoes of the customer for the time being easily can ascertain the status of the job. He should pass nothing he knows the customer will not accept.

If a man has put in a new front wheel bearing and has made a poor adjustment on the steering mechanism, the customer is sure to come back and kick. The inspector's job is to eliminate the kicks.

The Daily Shop Record

In connection with the Vesper-Buick article last week we mentioned the use of a daily shop record. One copy of this is kept in the office, one by the maintenance salesman and one by the shop foreman. In this way it is possible for all to know just what is going on all the time. When a customer calls up and seeks information about his job he can be told about it from any of the three departments.

The small shop is often a little slack in its methods of keeping tab on the jobs which are going through. It is true they have shop orders, etc., for each job, but if a customer calls up the place and happens to talk to the bookkeeper, the latter seldom knows anything about the job in question and consequently has to make a trip out into the shop or go to other means to find out.

In a small organization there are not as a rule telephones in all parts of the building and calls are likely to come into the office only. We believe it possible for such organizations to get a plan whereby the office attendant will at all times know what jobs are going through and can intelligently inform a customer when he calls up.

We believe a record sheet like the one shown last week can be used to advantage in the small shop. It might be made out by the foreman or the inspector whom we have said is to represent the customer. It takes but a few moments to jot these items down and carbon copies are easily made. Aside from the value of keeping tab on the jobs going through the record is valuable in that it is an accurate record of the day's work. It is possible later on to plot from this daily shop record many valuable curves showing the trend of the business.

Eliminating Small Losses

While the overhead is not so great in a small town dealer establishment, small losses here and there will eat into the profits so quickly that unless checked will seriously hamper the success of the organization and may even spell its ultimate ruin.

A boy has paid his salary over and over again in the Vesper-Buick organization because he sees to it that no tools are lost or broken, that mechanics do not help themselves to grease, oil, sandpaper, emery cloth, cotter pins, nuts and bolts, etc.

The boy whom we have said a little while ago might easily be used for cleaning parts for the mechanics, might also be used as a means for checking shop losses. Put him up in a little room and let him know that he is boss over that room; that he must not pass out a single item, without a requisition for it. Let him know that when a car rolls over a copper oil bucket, that the bucket is practically ruined and that a new one will cost probably several dollers. Let him keep an eye on the floor and when he sees a mechanic has finished with a certain shop tool. oil bucket or anything else, he must pick them up, wipe them clean and put them carefully away in his "stock room" for the next man to use. The boy may note an electric light burning where it is not necessary. He turns it out. The same is true of a running spigot. He does all these small things, which at the end of a year will save enough money to pay for his services with some left over.

Besides, you have a better looking shop, to say nothing of bettering the working conditions. A boy trained in this way, and who is anxious to learn the business, may later be the best man in the organization, because he has been taught the value of cutting down costs and increasing efficiency.

General Appearance

As will be recalled, we said in last week's issue that outwardly the Vesper-Buick maintenance building is handsome architecturally and its beauty will be enhanced this year by shrubbery and other decorative means. All of which has not the slightest thing to do with fitting a piston or adjusting a rear axle, but which does make the customer feel that here he is pretty sure to get the best possible sort of work done. A concern which goes to considerable trouble to make its place inviting, is very apt to use approved methods in its work on customer's cars. You feel at home in this place. You realize it is a real business and is being carried on as such.

In some of our maintenance departments, especially the smaller ones (although there are some large institutions in big cities that are bad offenders) the thought seems to have been to make the place about as uninviting as could be. There are a lot of offensive signs, which rather misdirect than direct a customer. There are boxes and crates piled up just outside the entrance. There are greasy finger marks on the doors and if a woman driver is not careful in stepping out of her car she may trip over a jack which has been allowed to lie in the entrance. There is little use in going on further to describe some of the uncouth conditions which exist around so many of our maintenance stations today.

Take a lesson from the Vesper-Buick company and make your customers feel at home. A two thousand dollar motor car, which glistens like a new silver dollar, does not look well in surroundings more in keeping with the popular idea of a junk shop. Make sure that the customer when he comes into your place of business is surrounded with conditions commensurate with the high class product you sell.

Advertising Your Facilities

Take another lesson from the Vesper-Buick company and see if you cannot make your newspaper advertising or direct by mail advertising say something. The average car owner likes to know something about his car and if you have a machine for doing an operation better than he ever can hope to do a job by hand, advertise the fact. The Vesper-Buick company took a number of its best features and advertised them by means of cards. Surely one of these cards will strike a man's fancy with the chance that sooner or later he will bring his car around to take advantage of this service which these cards were exploiting. (Several of these cards were reproduced in MOTOR AGE.)

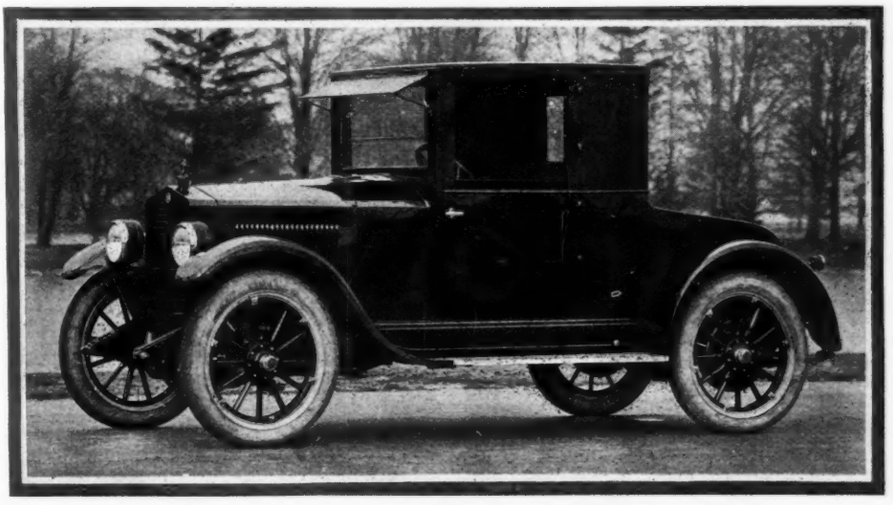
Look over the newspaper advertising of most small town dealers and see the meaningless phraseology. "Let us overhaul your car," and "We make your old engine like new," "Doll up the old bus," etc., don't mean a thing these days. Most people who drive think the average maintenance station is run by a set of pirates and all advertising goes for nothing unless it can show a real message of a real institution.

People in a small community like to know details. The name Tiffany or Marshall Field in a metropolis is sufficient to suggest service and their advertising matter may never go into details regarding their articles of merchandise. Still the concerns prosper. But with the small town store or automobile establishment it's different.

You must tell people more about what you have to sell. If you have a cylinder regrinder, then you must tell them all about cylinders wearing oval in time and that you have the machine by which to true them up. Run a picture of the machine. Do this with other phases of your business and convince the car owners of your community that your establishment is not in the ordinary garage class.

If one of your customers happens to tell you that he likes to come into your place of business because there is no "stalling" in telling him just what is wrong with his car, advertise the fact that you have a real trouble shooter in your place. One of the largest cab companies in the country advertises its drivers continually and when you have finished reading the ads about them you feel almost highly honored to ride in their cabs from what you know about the driver. Why should not the dealer advertise the men in his shop upon whom the customers largely depend to get the maximum service out of their investment?

Essex Cabriolet, a New Closed Model



ESSEX MOTORS announces a new closed model—the cabriolet. It resembles its predecessor, the Essex coach.

The Essex cabriolet has wide doors, permitting maximum range of vision for driving. The doors are held rigidly by four hinges. A cowl ventilators, sun visor, radiator shutters, motometer, transmission lock and cord tires are standard equipment. Upholstery and floor rugs are of a fine texture of long wearing material. The seat is low and deep cushioned. Its price is $1295, f.o.b. Detroit.

The Fable *of the* Hard Worker Who Landed *on His* Feet

By TOM WILDER

Elwell Rogers came Back from college Wearing Hot-Dog clothes

ONCE there was a Darling Baby Boy who, ere he had shed his rompers gave promise of being a Mechanical Genius. He should have been dropped in the cistern here, but that would have put the Kibosh on our Tale so we will let him live.

Before he could say Ma-Ma he knew all his father's tools by their given names and could Throw a Bluff at using them on the ancestral furniture. While still indulging in Baby Talk he dissected the alarm clock and put it together again so that it would almost run.

Kindergarten, he considered a waste of time so he Bummed and spent the Golden Hours building dog-wagons, kites, lath railroads, windmills, etc., much to the admiration of Fond Parents and relations. Thus it came to pass as Rollo —for this is the label his Mother had tied on him when he was too Young to Know or Register a Kick—grew older he soon became Hep to his own importance and his Bump of Ego grew day by day.

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Imagining himself cut out to be a Running Mate of J. Watt or R. Fulton, he would Camp by the hour steadying the Power house wall, watching the wheels go 'round. He gloated over the fact that he was Wise to how the fire made the steam and the steam pushed the plungers in the cylinders of the engine.

While other boys played Run Sheep Run and Drop the Handkerchief he was over at the Round House helping Tony the Wiper Blow out flues or watching the Boss and Bill the fireman fit a new journal on No. 5, so she could make the run to Waterloo and meet the Flyer from Kansas City.

He couldn't understand why all the Sweet Patooties Shied and grew Mum at his approach or seemed to prefer the company of all the Cigaret-Smoking, Penny-Matching, Cut-ups. His Line of Guff was certainly more to the Elevator than their Chatter, all the Janes must be Dumb-bells. He must be Shooting over their Heads.

Thus the Seasons came and went and Rollo's Ego grew and grew. His parents were not sure whether he was to revolutionize transportation or simply carry on the work where Tom Edison left off. Remembering his earlier Works in Dog-Carts and Lath Railroads and his interest in the Round House they Laid their Money on the Transportation for Rollo had never shown much interest in the illusive intricacies of Juice.

About this time the first Horseless Carriage came to town and Rollo was Helen Keller to everything but It. Pinkerton was a Dummy compared to the way he shadowed that Bus. He even got a vacation job in the town machine shop so that he could be on hand when it Blew In for repairs which it did with Great Regularity.

When he arrived at Eighth Grade, Rollo had Shot Himself so full of Mechanical Hop that he could think of nothing but Wheels and Bearings, Cams and Pushrods, Cranks and Eccentrics. He was Off of Book-learning and Craved Development in the machine shop rather than waste more time on the Languages, English, Chemistry, Mathematics, etc., which never would help him with Machinery. Practical Experience was his Goal so he Teed Off and Drove for 18 Holes in the local Machine shop and punched the Clock regularly for several years, by which time automobiles had become a rather common sight and he knew as many of their inner Secrets as any one West of Detroit, Mich.

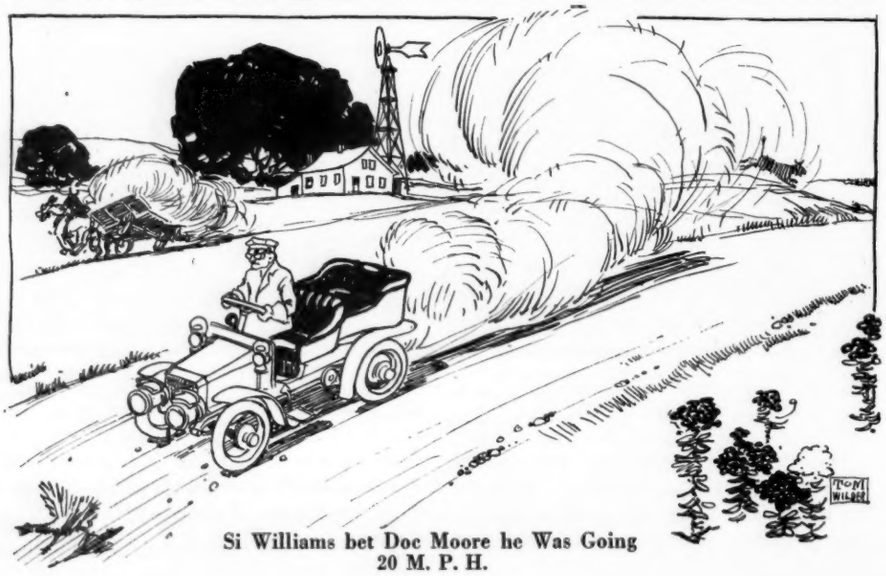
-:--:--:-

Now it happened that one of Rollo's early schoolmates, Elwell Rogers, one of the cigarette Smoking Cut-ups went away to college and after spending four years and a good share of Dad's Jack returned to the home town with a pedigreed Boston Bull, an unsurpassed Line of Bunk, Hot Dog clothes and a Frat Pin. He also had annexed a big Red Touring Car with a Rear Entrance Tonneau, Brass Lamps and Compressed Air Tires.

When he drove up ahead of clouds of dust that had followed him all the way from Chicago, Jammed on the brakes, Honked the old Black Bulb and slid to Home Plate in front of the Kelly House all the local Horse Flesh that wasn't tied started with one accord for the opposite end of town. Si Williams bet Doc Moore two shillings that Elwell was going 20 m.p.h., but he couldn't collect because speedometers weren't stock Equipment in Them Days.

The girls all gasped and wondered if it was safe. Young Bloods who sported Three Minute Colts saw defeat and threatened to sue Elwell for damages if his Red Devil scared their Pets. The Graybeards Wagged their Beans and looked dubious "they wouldn't trust their hides to any such contraption of cogs and wheels, not by a jug full! Runnin' on them air tubes, too, spose they was t' bust! then what?"

But the Big Bomb Exploded next day when the Evening Bug announced that



Si Williams bet Doc Moore he Was Going 20 M. P. H.

C. Elwell Rogers would open a display room at 100 Main Street and would represent the Chug Auto Co. of Chicago, in Lake County, selling their two famous lines, the Go Lightly Runabout (one cylinder) and the splendid four-cylinder Packomobile noted for its Power, Endurance, Speed, etc., etc.

-:--:--:-

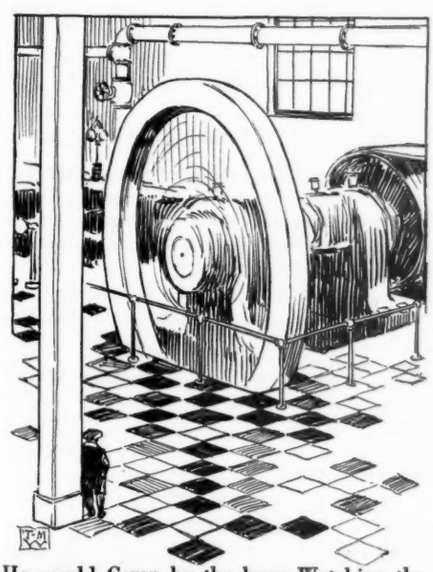
The Town was all Worked Up but none were nearer the Nut Factory than Rollo. He wanted to Ask the World where this Bird of the Charlotte Russe and Mayonnaise got a license to deal in Motor Cars. "He couldn't Pipe the difference between jump spark and Make and Break Ignition or whether there were one or four cylinders under the Hood unless the Catalog said so. Suppose this Goof is lucky enough to Unload a Buggy on some credulous Gink with more money than Sense, Cart Wheels to Gingerbread he will come to Grief before he can finish his first Joy Ride and Make a Landing at the residential Horse block."

Now C. Elwell Rogers was a salesman of the Gold Brick variety. His Motto was "Deliver the Junk and Capture the Coin; Let the other Geezer Worry, I Can't be Bothered."

But as time passed to the tune of six or eight months C. Elwell discovered that his Dome was not proof to Worry. Some of the Go Lightlys he had sold were Running About and some were not. A good share were Indisposed or Waiting for parts from the Factory or broke down, etc. In short the Gossip that was going the rounds about what customers though of him and his Junk was making quite a Dent in C. Elwell's heretofore Unruffled Crush.

Sales came only after a long hard Pull up Hill in Low and usually the only argument that would Throw and Hitch the customer was a promise of Free Repairs for a period ranging in length according to his Tightness.

C. Elwell had now turned His Motto to the Wall. He found he couldn't Stick



He would Camp by the hour Watching the Wheels go Round

All the Sweet Patooties shied at His approach

without being Bothered. He didn't know how to do this repair work or train anyone else but from Personal Experience he knew that if he turned it over to the local Machine Shop, customers would Ride him for Repairs until his profits were all spent and the prospect was not to the right side of the Ledger.

In the Meantime our Mechanical Prodigy was doing some Brain Storming himself. Everything was All Wrong. Here he was, the most expert machinist and Auto Authority between Chicafo and the Missouri River working in a machine shop at $18.00 per, while this classically educated Wind Jamming Rogers romped away with the Gravy. While he delved in Grease, Elwell the Glib Tongued, cavorted down the Turnpike to Show a Prospect or chaperoned some Luscious Jane to the Violet Patch.

-:--:--:-

The tickets sure had been Garbled, he had drawn 2nd balcony Z-23-L, while the Candied Haberdashery displayed itself in a Box Seat-Right-of-Stage.

Elwell's business was Batting a low average under the new agreements, sales were again lively but repairs were livelier and the Machine Shop bills took all the joy out of life.

One day he met Rollo on Main street and experienced one of those instantaneous hunches that sometimes change the course of men's lives. "Rollo, old top, how are you!" he said, "I've wanted to see you for a long time (they had passed at this identical spot the day before), say but you're looking fine (his $10 hand-me-down looked great beside Elwell's Chicago tailored creation), come over to my office this evening—want to talk to you."

Rollo's first impression was to land a bounce on the Dome of the confectionery that would square all differences but his mechanical training had taught him control—so he said "All Right" and went for an earful more from curiosity than interest. Elwell received him like a duke and poured broadside after broadside of bunk into him about the glories, prospects and future of the automobile.

Concluding he said, "I know from heresay and personal observation that you are the greatest automobile wizard in these parts and it is nuts for you as well as me to be in this organization. Whatever stake you are drawing now is a mere bag of shells to what you would be worth to me and the reputation of Go Lightly Runabouts. I am going to bump the wise ones here about and put in a repair shop that will take care of the automobiles I sell at the least possible cost to me and my customers. The charges of the Advance Machine Co. are rapidly putting the skids under me. I sell the cars, they eventually get the profit.

-:--:--:-

Rollo, however, could see no great boost for Rollo in a change of this sort and so expressed himself. He was boss of the largest shop in the vicinity, why jump to a small one. The only come-on was salary and the pay wagon was self-admittedly in a bad way, why should he Play Straw to a Drowning Man? Clearly he would be working lady luck with the cards stacked for the other party. If the shop was a success he might eventually hope to draw $2,000 a year. If it failed he would have to take the ties. There wasn't another job his measure in town. It was a battle between bunk and better mechanic and finally both won by a compromise.

It was agreed that Rollo should become a partner in the firm of Rogers & Blake with a one-third interest. He should have a salary sufficient to pay up his interest and have commission on his sales besides. He should have charge of all repairs but instead of donning the grease rompers he should be a gentleman mechanic — sell service—hobnob with customers over their troubles and seek always to impress them with his knowledge and ability to keep Go Lightly Runabouts running 365 days a year.

Rogers should devote himself to sales, unhampered.

The sketch was a hit from the time the curtain went up. While Rogers sang the solo part, Rollo Blake did a buck and wing and in difficult passages they clogged in unison.

Rogers took in most any old derelick on a "Trade In," Blake made it good as new and sold it at a profit; in fact, Rollo was so successful at disposing of Used cars made new that the firm made them a feature and guaranteed them the same as the new ones.

Thus did the natural born genius climb the tree of success only when boosted by a scatterbrain.

Moral—Don't Make Fun of a Cake Eater—He May Someday be your Boss.

Special Battery Electrolytes—*What Are They?*

How Special Dope Solutions, While Giving Battery Extra Power for a Short Time, Result in Premature Destruction of the Plates and Separators

THE action of the automobile storage battery depends on a reversible chemical process the nature of which is well known. **A chemical change** in the nature of the elements of the battery **producing the voltage** which supplies current for various uses on the car, while **reversal of the current** through the battery **reverses the chemical changes** restoring the battery plates to their original condition.

Within the last year or two, however, there have appeared on the market special solutions which are supposed to restore the battery to its original condition of charge without the laborious process of sending the current through it in the reverse direction for a period of hours—the surprising feature of this being that such discoveries have been made by comparatively unknown concerns, whereas the old time battery concerns which have been putting a reliable product on the market for years, and which maintain a staff of chemists and experimental engineers, have been unable to discover any such quick charging methods.

A recent investigation by the chemists of the well known battery concerns have developed the fact that these quick charge solutions are mainly based on using strong sulphuric acid which is known by every chemist and battery engineer to be very destructive to the battery, although temporarily it appears to give it additional life. The structure of the plate of which batteries are made is a sort of frame work of lead into the spaces of which is pasted a compound, which is known as the active material. Two sets of plates surrounded with a solution of dilute sulphuric acid and with separators keeping the two sets of plates apart, comprise an individual cell.

While the chemical action, which changes the material of the plates into a lead sulphate, is chiefly present when current is allowed to flow, there is also a slight discharge action going on all the time and when the concentrated sulphuric acid is used, the destructive action is more pronounced, although for a limited time it is, of course, accompanied by a corresponding increase in electrical energy produced.

Batteries in which strong acid has been used are found, after a few weeks, to have had the frame work of the plates eaten away and the separators rotted so badly that the battery is ready to be junked. Those battery stations that are interested in displaying for the benefit of their customers a warning chart which explains the effect of dope solution can obtain charts for use in their battery stations by writing to the Vesta Battery Corp., Chicago. These warning charts were made originally for use of the Vesta stations but are available for other stations as long as the charts last. Among other things the warning chart gives chemical analysis of 10 of the so-called wonderful electrolytes which are on the market. The analysis being as follows:

	Solution. Base—Sulphuric acid
1.	Color: Yellow. Changes to pale green on aging (Due to reduction of chromates to chromium sulphate)
	Found: Chromates in fresh solution Chromium in stale solution Iron (considerable amounts, probably accidental) No other metals in more than faint trace
	Solution
2.	Color: Water white Found: Sulphuric acid and sulphates Trace Iron (accidental?)
	Solution
3.	Color: Water white Found: Sulphuric acid and sulphates Trace iron, trace manganese (probably accidental)
	Solution
4.	Composition traced by U. S. Patent Contains 1400 sulphuric acid Sodium phosphate
	Solution
5.	Color: Water white Found: Sulphuric acid
	Solution
6.	Specific gravity 1.2357 per cent Sodium sulphate 2.59 per cent Sulphuric acid 26.90 per cent
	Solution
7.	A rather low grade battery acid of variable gravity, some samples 1,290, others 1,325.
	Solution
8.	A very low grade of sulphuric acid containing enormously high iron and nitrates
	Powder
9.	These people evidently made a change in their dope but the change was for the worse. The powder is commercial sodium bisulphate, which would form sulphuric acid, and sodium sulphate in solution
	Solution
10.	Simply a very high gravity acid containing a few per cent of sodium sulphate.

In examining the analysis it will be noticed that many of these solution contain iron which is well known to be highly destructive to the storage battery. This is possibly due to the use of impure sulphuric acid, commercial acid being used instead of chemically pure acid. The foregoing analyses were not all made in the Vesta laboratories, but are the result of investigations by practically all of the large battery concerns which, by years of service to the public, are known for their reliability and integrity.

In regard to the so-called dry or jelly battery, it might be pointed out that their only advantage, as far as can be ascertained, is that the liquid will not spill. This form of battery is far from being the newest invention, as previous to 1890 the Oerlikon Machine Works, Switzerland, put out a very good battery of this type and the Vesta Battery Corp., previous to 1910 also sold a battery of this type, designed for ignition service only. The effect of the jelly electrolyte is, of course, to prevent spilling but at the same time it prevents diffusion through the electrolyte so that when discharge takes place, the action is chiefly at the surface of the plate and the heavier acid in other parts of the jelly has some difficulty in getting to the surface of the plate. This means that chemical action is hindered both on discharge and charge.

The text of the Vesta warning poster is as follows:

WARNING

The motoring public is being imposed upon by sharpers who are offering a remedy for battery trouble in the form of battery solutions under fancy names. They would have you believe that by using their "dope" they can increase the power of your battery and cure all battery ills.

YOU KNOW BETTER

You know that the action of your battery depends upon the combination of the material in the battery plates with the sulphuric acid in the solution to make electric current.

It follows that if stronger acid is used, then a more powerful electric current is generated.

But you know that the use of strong acid, while it gives the battery a greater "kick"—does so at the expense of ruinous sulphation of the plates and and rapid destruction of the separators.

The maximum strength of acid used in standard battery practice by all battery manufacturers is from 1280 to 1300 specific gravity for a fully charged bat-

tery, for at this point the battery will give the most power in proportion to the wear on the parts.

Therefore if you wish to force more power from your battery by the use of strong acid or "dope" you will do so at the great expense of premature ruin of plates and separators.

The usual instruction of dope solution sellers is to have you empty the battery solution, and they may point out that they add acid of, say, 1250 degs. strength.

Remember that the acid goes into the plate in discharging and when this new dope is put in it is really replacing acid of 1150 degs. to 1200 degs. Therefore the use of 1250 degs. acid at this point means the addition of 50 to 100 points to the acid strength. When such a battery is then charged and the acid in the plates is driven out by charging, the real or total reading will be 1330 degs. to 1380 degs.—50 to 100 points too high.


WARNING

The motoring public is being imposed upon by sharpers who are offering a remedy for battery troubles in the form of Battery Solutions under fancy names. They would have you believe that by using their "dope" they can increase the power of your battery and cure all battery ills.

YOU KNOW BETTER

You know that the action of your storage battery depends upon the combination of the material in the battery plates with the sulphuric acid in the solution to make electric current.

It follows that if stronger acid is used, then a more powerful electric current is generated.

But you know that the use of strong acid, while it gives the battery a greater "kick"—does so at the expense of ruinous sulphation of the plates and rapid destruction of the separators.

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DOPE SOLUTIONS:

The motoring public knows better than to add strong sulphuric acid to storage batteries (a drug store charge) and is aware of the necessity of using nothing but distilled water.

It will doubtless be a surprise to learn that practically all dope solutions are not only mere sulphuric acid solutions but in many of them impure acids have been used so that they contain the ruinous impurities which you have striven to avoid.

The following analyses are fair examples of what is being sold for $2.00 to $5.00 per gallon. If you want to ruin your battery with strong acid, why pay such a price for it?

There is nothing that the average of these solutions will do that strong acid of the same strength will not do to your battery.

1 2 3 4 5 6 7 8 9 10

The so-called dry or jelly batteries and concoctions for producing this result in any battery are merely solutions which jellify or solidify the sulphuric acid, of which silicate of soda is a well-known example. This reduces the high discharge capacity of the battery naturally, because circulation is stopped.

ALL BATTERY GUARANTEES ARE VOIDED WHEN ACID OR DOPE SOLUTIONS ARE USED

VESTA BATTERY CORPORATION · CHICAGO

Warning sent to its dealers by the Vesta company telling what the special battery dope solutions really are

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Two Kinds of Night Men

THESE contrasting incidents are taken from a recent issue of The Radiator:

Robert W. Martland, state secretary-manager of the California Automobile Trade Assn., had a very peculiar experience while on his last tour.

After a meeting one night, Martland took his car to a garage. The place was lighted up nicely in front, but the doors were closed. He pressed a small bell labeled "Night Bell," and his finger no sooner touched it when the door opened. A night man came out and the following conversation took place:

Night Man: "Just beat you to it, didn't I?"

Martland: "Yes! Have you room for my car?"

Night Man: "Certainly sir, just wait a minute until I move this car."

After pushing the car up, as the garage was well filled, the night man came back and inspected the car, while Martland was still in it.

"That's a nice car—is it the 1922 Chandler?" he asked.

"Yes, it is," replied Martland, wondering what he was driving at.

Once again the employee ventured a remark, "First one I have seen, surely a pretty car all right. Kind of dusty isn't it? Don't you think I had better wipe it off?"

Martland replied that the car was new and he did not like to have the car wiped off as it marred the paint.

"What time you going out in the morning?" the man inquired. Martland began to see light.

"About 10 o'clock in the morning."

"Fine," replied the man, "that will give us ample time to wash the car and the windows if you care to have us do it."

Needless to say the car was washed. That man was one out of a thousand. He was courteous and actually sold his customer a car wash. Most night men feel that it is their duty to keep customers OUT. What kind is yours? Could he sell anything, or be courteous? We have a hunch that this Casa Blanca Garage man is without much company when it comes to night employees who render service of this kind.

L. H. Bennett tells of an experience in Pasadena, and the garage was an association member. Bennett noticed that his tail light was out and concluded that the bulb was defective. He drove into a garage which was dark except for a small office, in which four men were playing cards.

After driving in—no one came to ascertain his wants, so he got out a screwdriver and took out the bulb himself. Testing the light in the dash socket to be sure it was burned out, Bennett then entered the small office.

"Got a 6-8 volt, 2 candlepower, single contact?" he asked. One of the card players, who happened to be the night man, turned around and started to get up to get Bennett a bulb. Just about that time one of the players commanded, "Sit down you darn sap, and play the rest of your hand." The fellow must have been a "sap" because he did sit down and play out his hand.

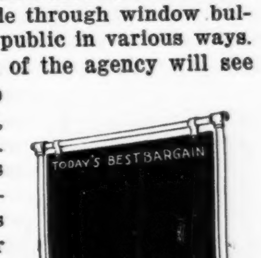
That garage lost a customer, a chance to make a 50 cent minimum charge and the place is the laughing stock of the motorist. Some of these night men cost more than their WAGES.

Gaspipe Makes Practical Bulletin Board

A Burbank, Calif., garage and automobile agency has found that by the use of gas pipe and elbows and T's and a sheet of metal painted black, a durable and handy bulletin board can be produced for sidewalk use. The illustration shows the method of construction. It is used especially for used-car offerings.

Another Southern California agency kept in touch with owners of cars by a helpful service to both owners of private garages and motorists seeking garages for rent. The concern knew that home-owners with garages to rent would not care to put them in the hands of real estate agents, and often would not advertise them in the want ads.

The agent, therefore, keeps a list of garages that are for rent and lets this be known to the trade through window bulletins and to the public in various ways. Often a salesman of the agency will see a sign and stop to take the name, address and rate. The agent thus makes a friend—and what is more, gives car owners one more reason for coming to the agency.



What Dealers Say About the *"Ask 'Em to Buy"* Movement

A GOOD many dealers are growing enthusiastic over the "Ask 'Em to Buy" movement, because they have tried it out and are getting results in the form of cash. This cash is, of course, shown in the profits at the end of the month, or whenever a dealer balances his books—and some maintain that dealers do balance them.

Every movement of this sort develops strength or weakness with experience. It appears that the "Ask 'Em to Buy" movement is developing strength. At least it is getting more boosters now from the dealers than from the higher up source, which is as it should be for any good movement.

On this page are printed some letters written by dealers regarding this movement. The letters are supplied by George Rinkenberger, who is somewhat notable as a jobber because few persons ever heard of his home city until they heard of his business. Rinkenberger is an illustration of the fact that the man is more important than the location. Washington, Ill., is not a huge city and most of his customers do business in small towns. But Rinkenberger enlisted in this "Ask 'Em to Buy" movement and the following letters indicate what his dealers think of it:

GENTLEMEN:

During the month of March I had the pleasure of being present at a dealers' and garagemen's "Get together" banquet and meeting through the invitation of the Washington Auto Supply Co.

During the banquet, given and presided over by Geo. Rinkenberger, manager of Washington Auto Supply Co., many valuable suggestions were brought out, which I consider have been helpful to me in increasing the sales of accessories, and especially the "Ask 'Em to To Pay" idea.

Although I had started January 1st, to ask the old accounts to settle, attending this meeting gave me new 'pep' and new ideas in making collections. I have been successful in cleaning up a large percentage of my old accounts, either with cash or short term notes.

I took my shop-foreman to this meeting, so that he could become better acquainted with the "Ask 'Em to Buy" idea, and I want to say there has been a good substantial increase in my accessory business through his persistence in trying to sell something to every man who drives into the garage. While I have not kept an accurate account of these sales, I know the sales on such items as spark plugs, bulbs, brake lining, oil, etc., have increased at least 50 per cent. I just noticed we have sold 100 gallons (in 5 gallon lots) more oil the past 30 days than during any previous 30 days.

Since this meeting the dealers of Pekin have been getting together once a week and as a result of the meetings, we have held a very successful automobile show.

OVERLAND CO. OF PEKIN,
By R. E. Joeger.

GENTLEMEN:

I feel that you would be interested in knowing some of the changes in Pekin dealers from the "Ask 'Em to Buy" meeting which you held here. After hearing you talk and seeing the film, I immediately saw where there was an opportunity of getting a great deal more business than we were getting.

To prove this to myself, I made it a point to ask every car owner, whose car was not already so equipped, to buy a stop signal. In three days I sold 156. Before I had never sold to exceed six in a week. This is not the only item that we have tried this on and we are going to continue right along.

Our business has been increased $125 a week, since this meeting, which will mean an additional profit of $4,000 a year, which I am going to get since I have been shown there are so many chances that the accessory man has never thought of before to get business.

It not only has increased my business, but I have talked to a number of other dealers in Pekin, who say the same thing and that isn't all you have done.

Before this meeting, when dealers in Pekin would meet by chance, some of them would cross the street to avoid speaking to a competitor. You got us all together on a Friday night; we soon found out that we were all real fellows and found out what a good thing it was to get together, so we have been having a meeting of our own every Friday and have also had an automobile show, which developed from these meetings.

If this talk was given and the film shown to every garageman, it would be the most wonderful thing that was ever done for the industry.

Yours truly, LOUIS WEIBURG, Pekin, Ill.

IN the Interest of the A. E. A.

During the month of December, I had the pleasure of being present at a dealers' and garagemen's get-together banquet and meeting through the invitation of Mr. Vowles, a salesman of the Washington Auto Supply Co.

During the meeting many valuable suggestions and pointers were brought out by George Rinkenberger, Manager of the Washington Auto Supply Co., who presided. Among the many things of utmost importance, were suggestions on the necessity of displaying goods to sell, the methods which should be used in "Cashing In" on the widely advertised articles (advertised by the manufacturer) which the dealer might handle, and various methods of attracting the attention of every car owner; by means of personal letters, bills, or tags on, or in, the car which would catch the eye of the owner advertising the class of work which your shop turns out, or some special article which the dealer might be particularly anxious to dispose of.

An outcome of this meeting was the neucleus of a permanent dealers' organization in Canton, and which has filled a long felt need.

Canton now boasts of an Automotive Association, which is second to none, and affiliated with a state organization and every member feels that through the kindness and far-seeing methods of the Washington Auto Supply Co., that they owe it the first credit of starting in Canton and Fulton County the "pull together" attitude, which every dealer, garageman, and accessory retailer now enjoys in this city and county.

E. J. CAROLON,
President Fulton County Automotive Trade Ass'n.,
Canton, Ill.

Motor Transportation in England

FROM London comes the information that "the development of the passenger-carrying side" of motor road transport in 1921 was noticeably rapid and satisfactory from many points of view, and that the movement had assumed considerable proportions by the end of the season may be judged from one instance alone, that the two motor coach stations which were established in Blackpool provided for some 300,000 passengers and accommodated 13,000 coaches.

"Young as this modern form of road travel is, it has already found fairly firm foundations. Novelty has ceased to be an asset. The average person who travels by coach today does not do so out of curiosity, but because he has found it to be the most agreeable mode of travel from place to place."

It is claimed that "a good sign for the future of motor coaching is that the demand to go farther afield from the local center is steadily on the increase, even to the extent of tours abroad. This is where light weight in comparison to carrying capacity, relatively high average speed, easy and quiet running, and a good margin of safety in freedom from brake failure, sideslip, and so forth, enter, for they are essential for successful long-distance coaching. The up-to-date small-type vehicle possesses these essentials, and it will be found that by its employment considerable stimulus will be given to the coaching branch of motor road transport in 1922."

Dealer Stages Show to Demonstrate Industrial Uses of Tractors in Cities

Many Different Applications of Mobile Power in Metropolitan Districts Open Sales Fields of Almost Unlimited Possibilities

Long Island City, N. Y., April 20

THE Hellman Motor Corp., Ford dealers here, staged a tractor show for the benefit of the Ford dealers in the metropolitan district of New York and New Jersey to convince them that the Fordson had many uses in the thickly populated districts. The Ford Motor Co. promoted the show. The exhibits illustrated the use of the Fordson as a power plant.

The Push and Pull Mule is an example of how well the tractor adapts itself to industrial uses. This is a Fordson tractor, equipped with rubber tires and fitted with steel bumper plates front and rear. It also has a quick-acting coupling so that it may be used for hauling trains of trailers. It has a pushing and pulling capacity of from 10 to 15 tons at speeds of from 6 to 12 miles per hour. It is intended for service in railway, dock or terminal warehouses.

Another tractor was shown with a hoist attachment. The drum is mounted on the rear of the rear axle housing and is driven from the power take-off by sprocket and chain and spur gears. It has a pulling capacity of from three to 10 tons. The drum will hold 3,000 ft. of ⅜ in. cable. The reverse is controlled by a brake. This hoist is adapted to pile driving, building erection, oil-well drilling, mining operations, etc. At the exposition, it was shown operating a bucket hoist. This equipment may also be used for snaking heavy loads.

A portable crane designed for unloading and loading work was also demonstrated. It consists of a structural steel frame with a block and fall. A niggerhead is placed on the power take-off. The crane will raise a 1,000 lb. load 9 ft. off the ground and, while so suspended, the load may be carried to any desired position and lowered under perfect control.

The automatic dump scraper attachment loads its own scoop with half a yard of dirt or other material weighing about 1,000 lbs., lifts the load and carries it to any desired position. It is intended for moving loose material for short distances but is not suitable for loading wagons. It is controlled entirely from the tractor seat. The power required to lift the scoop is obtained

One of the examples of industrial uses of tractors. A Fordson doing railroad hauling

through a set of bevel gears which is mounted on the power take-off. These gears turn a shaft running parallel to the length of the tractor. There is a clutch in this shaft. This shaft drives a transverse shaft mounted on the rear of the rear axle housing through another set of bevel gears. The drums on which the cables are wound are mounted on this latter shaft. The load is lowered by gravity. Another type is made with a higher frame so that it may be used for loading wagons.

The Fordson locomotive was shown pulling a train of three side dump cars on a circular railroad track. The front and rear wheels on each side are connected by connecting rods. The front wheels are spring suspended in a steel frame which is attached to the front and rear axles of the tractor.

Sweeper Designed for Snow Work

The rotary sweeper is designed for snow removal work. It sweeps a path 6 ft. wide. The brush, which is mounted in front at an angle to the front of the tractor, is driven independently from the wheels of the tractor. A shaft, with two universal joints, is driven through bevel gears from the power take-off. This shaft drives another shaft which runs parallel to the axis of the brush. The brush is driven from the latter shaft through sprockets and chains at each end. The unit operates at from 8 to 10 miles per hour.

A portable air compressor unit was shown in operation. This unit consists of a compressor and receiver mounted on a trailer. The tractor is used to transport it from place to place, and also supplies the power required to operate the compressor. The engine is fitted with a governor and this, in conjunction with the air pressure regulator, maintains a constant air pressure. This unit will operate three jackhammer drills under ordinary conditions.

A belt driven circular saw which attaches to the front of the tractor was also shown. This is a portable outfit as it may be lifted clear and carried by the tractor without dismounting the attachment. The saw is 30 in. in diameter and has a capacity of 30 cords of wood per day.

Another exhibit showed a 48 in. sawmill at work sawing logs up into planks. The tractor supplied the power for this work.

All the electric light used at the exposition was supplied by two generators driven by two Fordson tractors.

Numerous types of trailers were exhibited. For this work the tractor was equipped with a fifth wheel attachment. The trailers were equipped with dump bodies, lumber bodies, stake bodies, etc., to show the wide range of adaptability.

All the exhibits were shown in motion. The attendants were always ready to demonstrate or explain any point of any machine. Those who visited the exposition received a practical education on the usefulness of the tractor in the industrial field.

OHIO AUTOMOBILE ASSN. TO MEET

Columbus, O., April 29—The annual convention, banquet and good roads board meeting of the Ohio State Automobile Assn. is scheduled for Columbus May 15 and 16. The headquarters for the convention will be at the New Southern Hotel, where the sessions will be held. The banquet will be served at the Deshler Hotel, May 15.

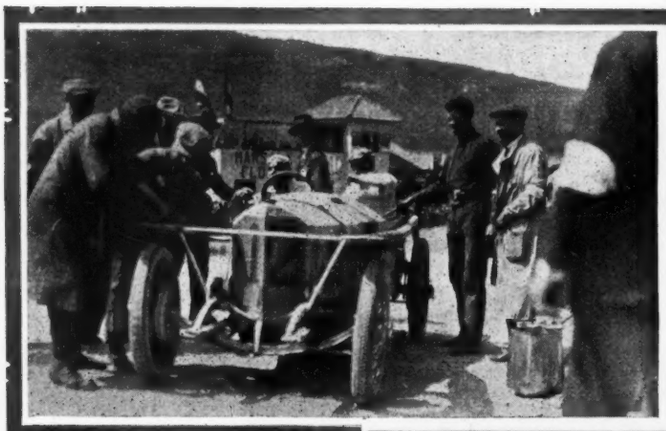


Fig. 1—The 92 cu. in. Mercedes with super charger. The fenders are almost parallel with the relative wind and protect the driver from the loose stones set flying by the wheels.

Fig. 2—Giacconi in 91 cu. in. Fiat which finished fifth in Targa Florio race

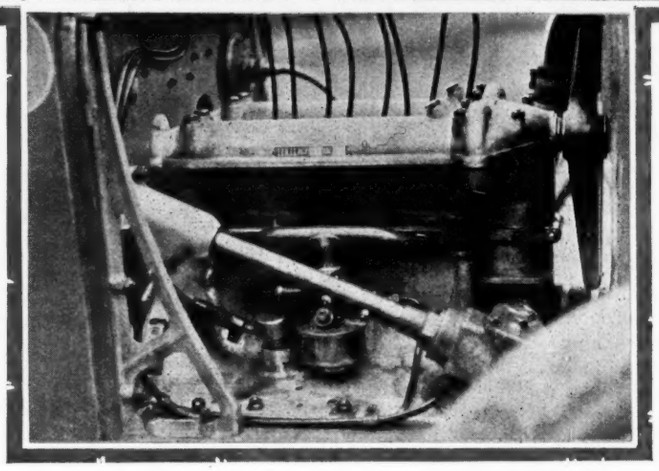


Fig. 3—All aluminum 67 cu. in. Austro-Daimler engine with electric generator on vertical shaft

Break Records in Targa Florio Mountain Race

Count Masseti in Mercedes Betters His Previous Time by Traveling 269-Mile Tortuous and Difficult Course at Remarkable Speed of 39.2 M. P. H.—Cars of Interesting Construction

THE first authentic reports regarding the 1922 Targa Florio held at Palermo were recently received from the MOTOR AGE foreign correspondent. There were 44 entries all told but the arduous course proved too much for some of the cars and drivers for only 26 of the cars finished the race. This was the thirteenth Targa Florio which is held each year on the island of Sicily, and it was won for the second consecutive year by an Italian amateur driver, Count Masseti. His four cylinder 1914 model high speed 300 in. Mercedes negotiated the 269 miles at an average speed of 39.2 miles per hr. which beat the Count's former record of last year when he won with the Fiat, by 34 minutes and 15 seconds.

The speed average which at first glance may give the wrong impression, is considered remarkable for the course at Sicily. The circuit which is 67 miles long and which had to be covered four times, starts from sea level elevation and rises to a height of 3,000 ft. There are 1500 turns to each lap making a total of 6000 turns to complete the race. The longest straight stretch is 13 miles on typical mountain road which is far from smooth.

Although there were many starters the race soon centered to a contest between the Mercedes the Fiats and the two French Ballots, with particular reference to the Ballot driven by Jules Goux, who finished less than two minutes behind the Italian piloted German Mercedes. Third place was annexed by Foresti with a 122 in. four cylinder Ballot, a duplicate of the car driven by Goux.

Fiats Handicapped by Tire Trouble

The small Fiats showed all the qualities of a winner but were handicapped by tire troubles, especially Giacconi who finished fifth due entirely to the unfaithfulness of his tire equipment and carelessness. On the last lap with third position his by a neat margin, he blew two tires and was forced to inflate by hand, the operation requiring so much time that he was nosed out of fourth position by the large 4x5.1 Alfa Romeo.

The other 91 in. Fiat driven by Biagio Nazzaro overturned on the second lap and although the car was put out of commission the driver was thrown clear and sustained only a few bruises. A news agency cabled the report that both driver and mechanic were killed and stated that the driver was Felix Nazzaro who is an uncle of Biagio. Felix was not even present at the race. Giacconi's Fiat is shown in Fig. 2.

In addition to Count Masseti's Mercedes the factory at Stuttgart sent six other cars which were piloted by the factory professionals, Lautenschlager twice winner of the Grand Prix, Salzer, Sailer, and Werner none of whom provided any real competition for Goux and Masseti. Four of the factory entered Mercedes were equipped with a supercharger the details of which were kept secret. It was ascertained from other sources that the supercharger which was applied to the two large sixes of 4.1x5.S and the two 91 inch fours incorporated some form of pump or turbine for maintaining the compression constant at the maximum altitude of the course.

The small fours are the latest product of the Stuttgart factory and have steel cylinders with a common water jacket for the four cylinders.

They are shaft drive and are equipped with cantilever rear springs the rear portion of the spring being much shorter than the front portion. They operate at 5,000 revolutions per minute. The

three cars driven by Lautenschlager and Salzer were declared to be the exact cars which ran in the 1914 Grand Prix but it was later learned that they had undergone considerable changes since then, the engine speed having been increased from 3,400 to 5,000 revolutions. It will be remembered that in 1915 Ralph De Palma drove a Mercedes of this type on the American tracks.

The type of 91 inch Fiat as driven by Giaconni represents the latest development of this famous factory. The little engine of 2.5x4.4 inches bore and stroke develops better than 65 horsepower at 5,000 revolutions and has a cylinder and water jacket similar to the small four cylinder Mercedes, but has only two valves per cylinder operated by two overhead camshafts. A feature of the engine is the use of roller bearings for every part except the piston pins.

Austro-Daimler Smallest Car in Contest

Lubrication is furnished by oil fed from a dashboard tank to the bearings and a dry crankcase is maintained by a scavenging pump which returns the lubricant to the dash tank. The maximum speed of this little car is 85 miles per hour and it is considered a stock sporting model. A similar engine but with eight instead of four cylinders was used in the 183 inch racer driven by Biagio Nazzaro, which is practically a duplicate of the Fiat piloted by Bordino on the California tracks recently.

By far the smallest cars were the entries of Austro Daimler having four cylinder engine of only 2.7 x 2.9 bore and stroke giving a piston displacement under 67 inches. These engines have aluminum cylinders with steel liners, a detachable head and two overhead valves per cylinder. Camshaft drive is from the front end by vertical shaft, the generator for supplying battery ignition is driven from this shaft. This diminutive engine is shown at Fig. 3.

There was nothing new in the Ballots that secured second and third places. They also are characterized by the maker as stock sporting models. They are fitted with four cylinder overhead valve engines of 2.7 x 5.1 inches bore and stroke and are similar in design to the eight in line job with which Goux will compete at Indianapolis May 30.

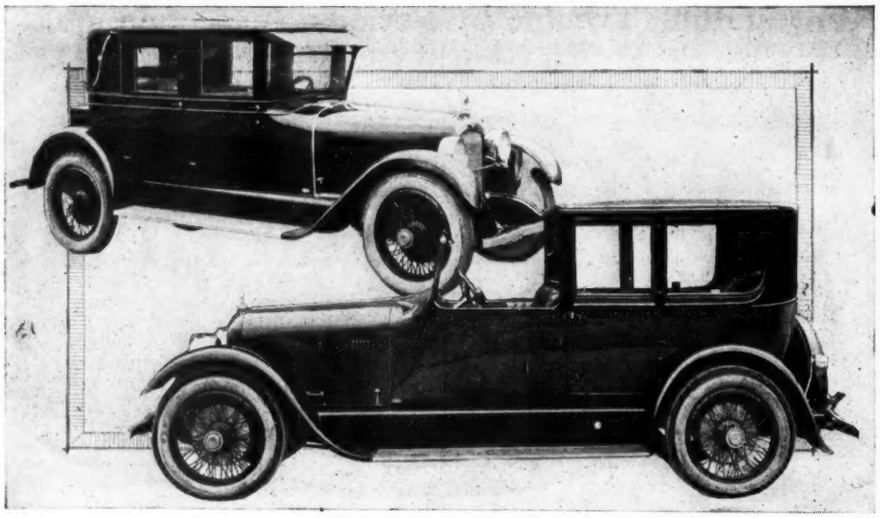
Reviewing the specifications of these cars one is impressed by the unusually high crankshaft speeds that are sustained, and the general use of steel cylinders. Among the chassis components that stand out prominently on the cars was the practically universal use of four wheel brakes and the use of low resistance fenders on several of the contending cars. These fenders where they were not of stream-line contour were so mounted that they were practically parallel with the relative wind and were used only to afford protection to the car and driver from the many small loose rocks that cluttered the course.

Forestalling Trouble by Periodic Inspection and Adjustment

THE advertising matter sent out by the Connelly company contains some valuable suggestions for other dealers. It is an excellent plan to try to get car owners into the maintenance department regularly in order that the many small adjustments which are required from time to time can be attended to by men skilled in the work.

Periodic inspection and adjustment means forestalling large repair bills. If a spring, for instance is regularly lubricated there is less likelihood of its breaking than when it is lubricated once or twice a year, if at all. A car which gets the attention it needs regularly will outwear one which is allowed to go unattended for a long time. This fact the dealer must instill in the minds of his customers.

A plan like the one suggested above should work out admirably. It tells the owner just what will be done to his car and while the operations are confined to a Ford car, there is no reason why the plan cannot be applied to other makes of cars. The fact that one of the company's men will call and deliver the car to the customer should have a strong appeal.



Two new Duesenberg closed models, shown above, have been added to the line of Straight Eights. The chassis of these are identical with the touring car, using such features as the front wheel brakes. The coachwork on these new models is said to be well executed and a glance at the illustration will reveal the smart body lines.

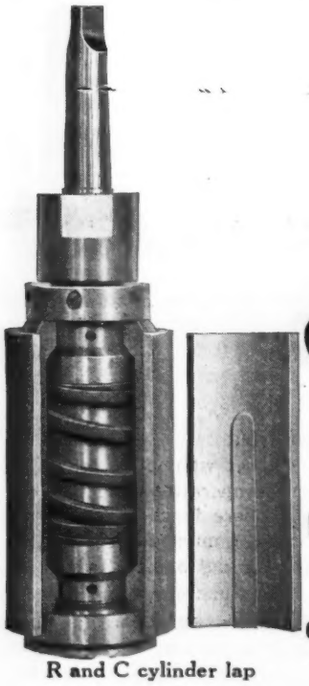
The R and C Lapping Tool

ALTHOUGH the process of lapping has been used for finishing the working surfaces of gasoline engines in some instances, most persons have regarded it as impractical for this purpose because of the crudeness of the tools made for lapping and the meager knowledge existing regarding the correct abrasive.

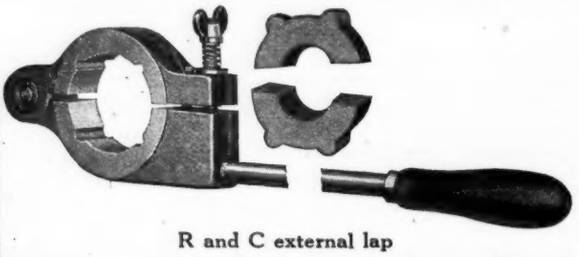
The R and C Lap Company, Davenport, Iowa, has brought out a line of standardized laps, both external and internal, with interchangeable and replaceable shelves. The shelves come in two grades depending on the speed of cutting desired and the type of work. The claim is made that the design of the lap and the use of a standardized abrasive render unnecessary highly skilled labor and lengthy experience.

The lap has a floating shank and an expanding device for adjusting to size as well as for taking up wear of the soft metal which is charged with the abrasive. It is also claimed that while the lap is expanded a diameter is kept constant over the whole length assuring a true bore free from taper and bell mouthing.

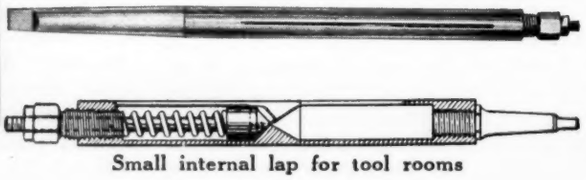
The soft material is said to prevent any of the abrasive remaining imbedded in the surface being lapped. Another advantage claimed for lapping is that it renders unnecessary the running in of new engine or engines to which pistons and rings have been fitted. Purchasers of cars ordinarily are cautioned to drive slowly during the first 500 or 1000 miles to prevent seizing of the pistons or bearings while they still are imperfectly "worked in." This precaution is rendered unnecessary by lapping. The R and C external lap was designed for use in lapping crankshaft bearings. The crankshaft bearings are left 0.0001 in oversize and are lapped to size within 0.0001 or 0.0002. The connecting rod bearings are finished by means of hardened and lapped plugs and are then absolutely interchangeable, it is claimed.



R and C cylinder lap



R and C external lap

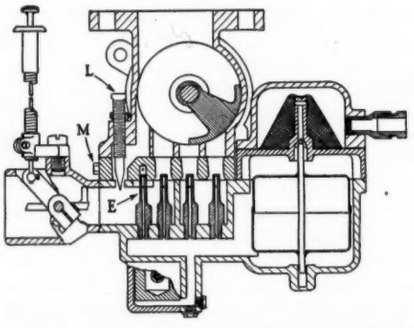


Small internal lap for tool rooms

New Denby 2½-3 Ton Truck

THE Denby Motor Truck Co. is starting production on a new 2½ to 3 ton chassis mounted on 155 in. wheelbase. The new chassis incorporates the Continental C-2, four-cylinder, unit powerplant, with 4⅛ by 5¼ in. cylinder dimensions. The chassis is designed to cover a wide range of purposes and is provided with plenty of room behind the seat. The length of the frame behind the driver's compartment is 144 in.

This truck is designed to have a speed range up to 25 miles per hr. on pneumatic and 18 miles per hr. on solid. The engine develops 39 hp. at normal speeds. Ignition is by magneto, cooling by centrifugal pump and lubrication by combined pump and splash system. The clutch is a Fuller, multiple disk, dry plate type lined with Raybestos. The gearset provides four forward speeds and one reverse and the rear axle is a Clark, model 2-D internal gear type providing an 8 to 1 reduction. The Hotchkiss drive system is utilized. The service brakes are on the propeller shaft, the brake drum being 8½ in. in diameter by 4 in. width. The hand or emergency brake is an external contracting type on the rear axle. The front springs are 44 by 2¼ and the rear, 52 by 3½. The wheels are steel and the tires either pneumatic 36 by 6, front and 42 by 9 in. rear, or solid, 36 by 4 in., front and 36 by 7 in. rear. The regular equipment includes solid tires, oil lights, hand horn, bumper, towing hooks and tools and sells for $2795 f.o.b. Detroit.



A NEW MULTIPLE JET CARBURETER

A new carbureter known as the Omac Constant Unit, has recently been placed on the market. It consists of a base casting containing a number of jets of various sizes and a direct acting float with needle valve at the top. A venturi plate in which is formed a number of venturi passages equal to the number of jets is fitted between the base and the flange casting which attaches to the manifold. In the flange casting is a sector shaped throttle arranged to progressively uncover the various venturi openings and thus bring the jets successively into operation. There are from two to four jets and tubes in each range, interdepending upon the size of the carbureter. Made by the Jennings Corp., 404 N. Richland st., Pittsburgh.

Some New Figures to Promote Tractor Sales

Survey by Department of Agriculture Results in Some Practical Statistics on Power Farming

Washington, D. C., April 13

A SURVEY of the relative value of tractors on the farm as compared with horsepower for drawbar work, has been made by the United States Department of Agriculture.

Analyzed, the survey's preliminary report shows that 75 per cent of the 354 farm owners, expressed their opinion that their tractors were more profitable than horses from a viewpoint of final results obtained.

The cost of using tractors for drawbar work on 354 farms of an average acreage of 500 acres, was $484 for the year, or $1.60 per working hours. In addition to the tractors used in the work, these farmers kept an average of 8.3 head of workstock. The cost of the workstock for the year was $541.

Based on a total of $1,025 for drawbar power, the figures show that the tractors furnished more than half the power, for 40 per cent of the cost of the entire drawbar work.

There were great variations in the practices and costs on individual farms and the results indicate that often the cost of using the tractors and keeping the workstock was excessive for the amount of work done.

As a result of the survey, the department will begin work at once determining exactly what work a farmer should use his tractor for and what work could most profitably be done with horses. Many tractor owners, it was found, had no definite idea as to exactly what work they should use their tractors for and what should be done by horse.

Tractors Reduce Horses and Labor

The average cost per crop acre was $3.37 per year for drawbar power for all the farms. This cost ranged from $2.21, as the average for a fourth of the farms with lowest cost, to $4.76 for the fourth of the farms with highest costs.

The tractors had been in use for 23 months on an average and the first cost had been $1473, about one-third higher than the present price of tractors of the same size and type. During the year covered by the investigation, the cost of fuel and oil was also somewhat higher than at present. On account of these lower prices it is estimated that the present cost of operating tractors purchased at current prices would be something like 25 per cent below the 1921 cost on these farms.

The effect of the addition of the tractor to the farm equipment was shown in changes recorded after the purchase of the tractor. On an average, these farms had been increased by 50 crop acres and there had been a reduction of 1.4 months in the amount of regular labor used. Three and one-third head of workstock in addition to those on hand at the time of the investigations would have been necessary if the work had all been done with horses. The tractor owners considered that they needed in addition to their tractors an average of only 6.5 head whereas they were actually keeping 8.3 head.

Effect of Use of Tractors on Power Costs

There was a net increase of $206 per farm in the combined cost of power and labor due to the use of the tractor, after deducting the cost of keeping the workstock which had been displaced and the value of the family and hired labor saved.

Had all the surplus horses been sold, there would have been a further reduction of about $115 per farm in the cost of horse labor. On many of the farms there had been a reduction of feed for workstock due to the use of the tractor and if this had been taken into account a further saving of about $47 per farm would have been shown.

The analysis of the cost per acre of power and man labor for different operations, when done with tractors, as compared to horse power shows the following:

Plowing spring and fall with tractors	$1.99 per acre
Plowing spring and fall with horses	1.88 per acre
Listing with tractors	1.10 per acre
Listing with horses	1.03 per acre
Disking (tandem disk) with tractors	.91 per acre
Disking (tandem disk) with horses	1.05 per acre
Drilling with tractors	.68 per acre
Drilling with horses	.52 per acre
Drawing binder with tractors	.87 per acre
Drawing binder with horses	.56 per acre

A survey of 85 farms where tractors were used and 85 farms where tractors were not used, both farms being of comparable size, shows that the cost of drawbar work on the farm where only tractors were used was $701, compared with $1,025 where tractors and horses were used.

There was an average of 10.5 head of workstock on the farmers where horses and tractors were both used. One horse was needed for each 33 crop acres, while the tractor owners were keeping one for each 42 crop acres and needed, in addition to their tractors, only one for each 54 crop acres.

Majority Say Tractor is Good Investment

The owners' opinion regarding the use of tractors showed that 75 per cent of the farmers interviewed believed that their tractors would be profitable investments, and 72 per cent of them intended to buy others when needed. The principal advantages mentioned were the ability to do more work in a given time, and the saving of horses in hot weather. Among the disadvantages, the first cost and depreciation and the running expenses were mentioned most frequently. The tractor was used as the primary source of power for field work by 59 per cent of the owners, while 41 per cent used the tractors as supplementary to horses. In 21 per cent of the cases, the tractor owners believed that the tractors had been responsible for some increased yield per acre.

646-MILE SEALED BONNET CONTEST HELD IN FRANCE

A 646-mile Sealed Bonnet Contest from Paris to Nice under the auspices of the Automobile Club of Nice, was staged recently.

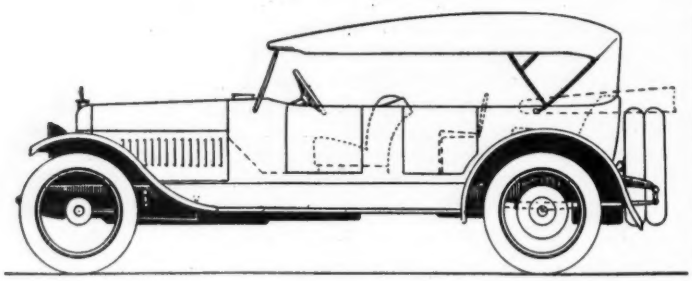
Entries in this event had practically every unit of their cars sealed, and in addition, seals were placed on the bonnet, it thus being necessary to make the run to Nice without doing anything on the car other than filling up with petrol and oil. The stages were Lyons, Marseilles and Nice, with a day's halt at each of the former towns, during which the cars were kept under official control.

Of the 16 starters, comprising all types of cars, one fell out on the first stage, another met with an accident on the last stage, two others had to break their seals and were penalized and 12 checked in at Nice with perfect scores. The successful machines comprised a team of three 10 h. p. standard four passenger Fiats, driven by Rouillard, Bradley and Mouzin, A Vermorel, De Dion Bouton, Itala, Cadillac, two Voisins, a Peugiot, Farman and a Lancia.

At the conclusion of the Sealed Bonnet Run, the successful cars were eligible for the La Turbia hill climb. This hill, which is near Nice, is historic, for, the first race was held over it 25 years ago when Andre Michelin, the tire manufacturer, won in a steam car. It is also one of the most difficult hills in Europe owing to its numerous sharp turns.

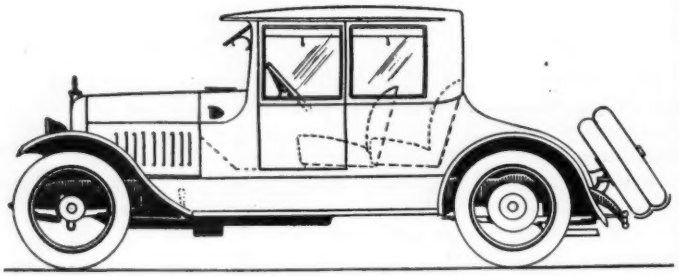
S. A. E. Standard Names for Body Types

The Society of Automotive Engineers committee on body names has reported to the parent society and the names given below have been adopted as standard by that organization.



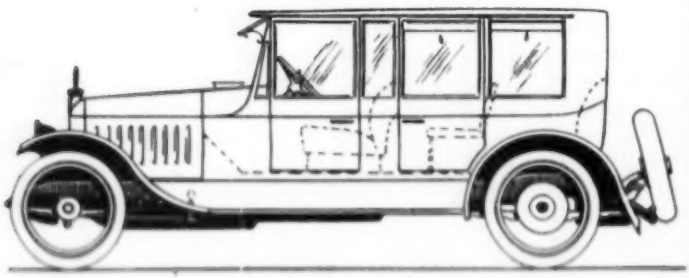
PHAETON

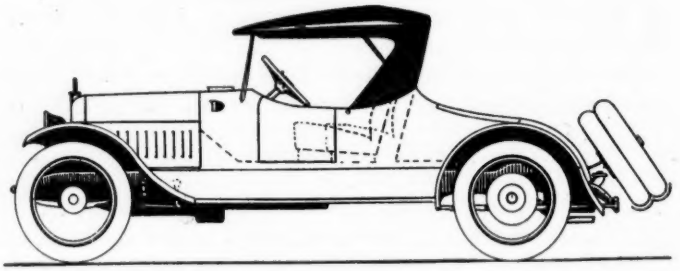
An open type body with two fixed cross seats for four or five passengers. Folding seats in the tonneau for two additional passengers are sometimes used. The conventional body has four doors and a folding top with removable side curtains. This car is commonly known as a touring model, but it was decided to call it a phaeton, as all types of cars are now used for touring purposes.



COUPE

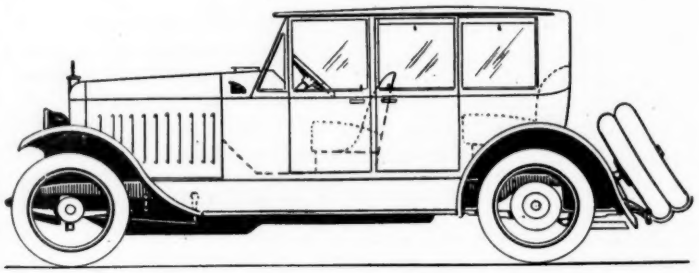
An enclosed single compartment body with one fixed cross seat. This seat may be straight and accommodate two persons, or be staggered and accommodate three persons. With the latter arrangement, a folding seat may be placed beside the driver's seat. The conventional body has two doors and two movable glass windows on each side. The roof is permanent and there is a luggage compartment at the rear.





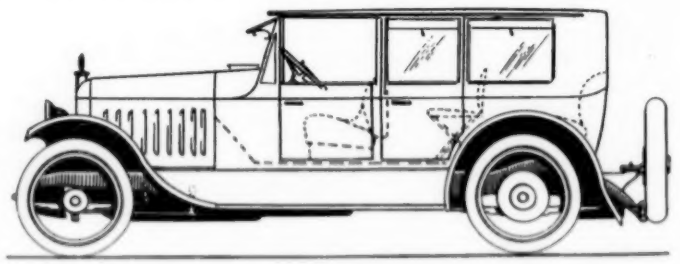
ROADSTER

An open-type body, having one fixed cross seat for two passengers and a space or compartment at the rear for luggage. Folding seats fitting into the luggage compartment are sometimes used. The conventional type has two doors and a folding top with removable side curtains.



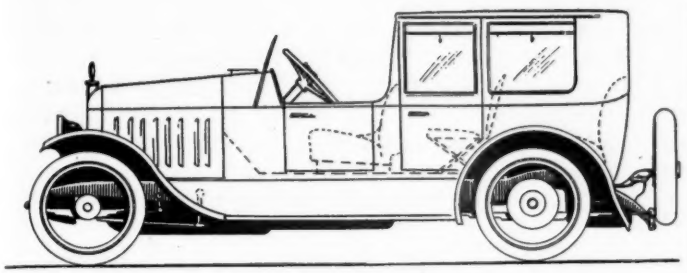
SEDAN

An enclosed single compartment body with two fixed cross seats for four or five passengers. Sometimes the front seat is divided by an aisle. Folding seats in the tonneau for two additional passengers are sometimes used. The conventional body has four doors, but some models have only two. There are three movable glass windows on each side and the roof is noncollapsible.



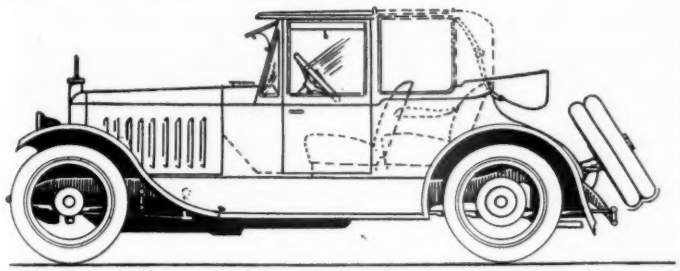
LIMOUSINE

A partially enclosed body with a non-collapsible roof that extends the full length and is attached at the front to the



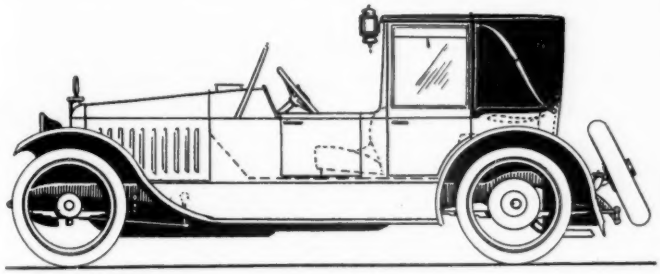
BROUGHAM

A body of the same general description as the limousine, except that the non-collapsible roof extends only over that portion of the body that is entirely enclosed.



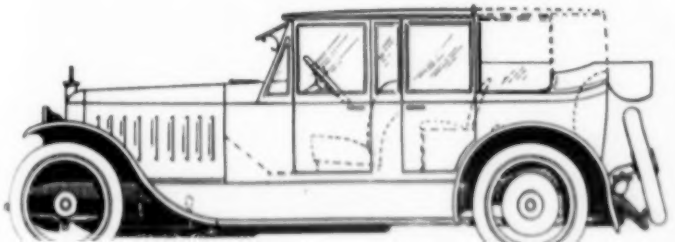
COUPE LANDAULET

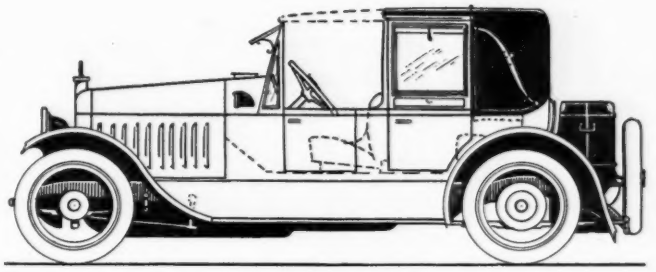
A body that bears the same relation to the coupe as the sedan landaulet bears to the sedan.



LANDAULET

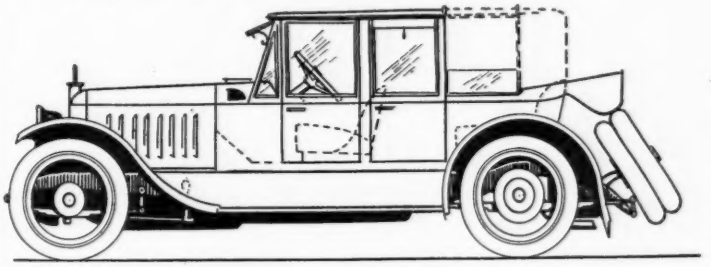
A body similar in appearance to the brougham, except that the enclosed section is shorter from back to front and the roof is fully collapsible up to the partition at the back of the driver's seat. The body has one fixed cross seat in the rear section for two or three passengers, two doors made with either flappers or hinged upper parts and glass windows in the doors only. The rear quarters, back and top, are covered with leather or fabric. There are outside joints to support the top. This body is similar in some respects to the cabriolet. The enclosed portion is somewhat shorter and consequently there is no room for collapsible seats.





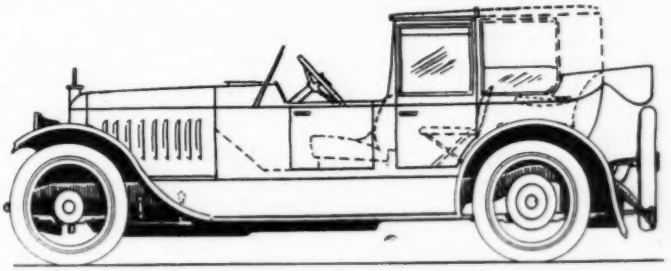
CABRIOLET

A body similar in appearance to the brougham and having the general characteristics of the landaulet, except that the falling pillar hinge is set back from the pillar line. The rear section is, therefore, longer than that of the landaulet. The body has one fixed cross seat for two or three, and folding seats on the partition for two additional passengers. Doors in the rear section are made with either flappers or hinged upper parts, and there are glass windows in the doors only. The top is fully collapsible, including the partition at the back of the driver's seat. The upper rear quarters, the back and the top are covered with leather or fabric and, in the conventional design, the top quarter at both the sides and the back have larger radii than other types of closed bodies. There are outside joints to support the top.



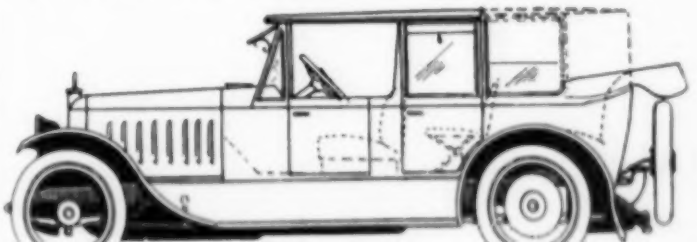
SEDAN LANDAULET

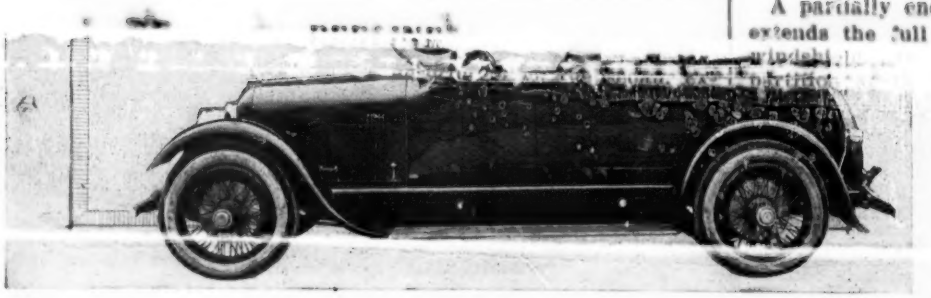
A body of the same general description as the sedan, except that the top back of the rear doors is collapsible.



BROUGHAM LANDAULET

A body that bears the same relation to the brougham as the sedan does to the sedan landaulet.





Two new Duesenberg closed models, shown above, have been added to the line of Straight Eights. The chassis of these are identical with the touring car, using such features as the front wheel brakes. The coachwork on these new models is said to be well executed and a glance at the illustration will reveal the smart body lines.

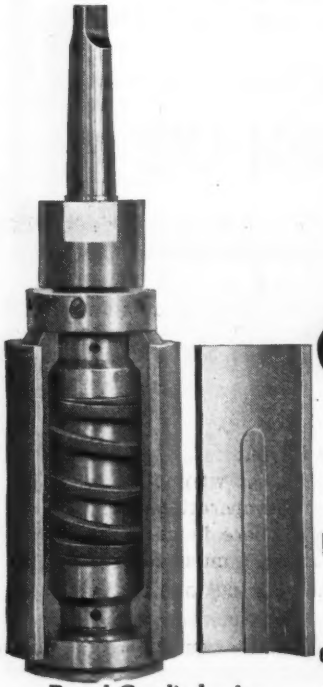
The R and C Lapping Tool

ALTHOUGH the process of lapping has been used for finishing the working surfaces of gasoline engines in some instances, most persons have regarded it as impractical for this purpose because of the crudeness of the tools made for lapping and the meager knowledge existing regarding the correct abrasive.

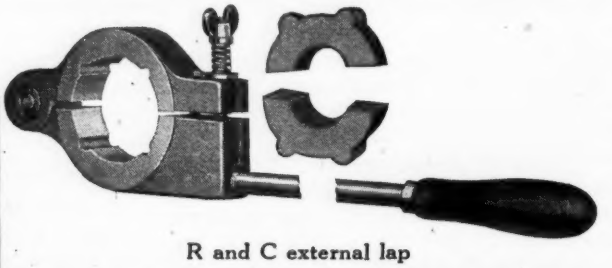
The R and C Lap Company, Davenport, Iowa, has brought out a line of standardized laps, both external and internal, with interchangeable and replaceable shelves. The shelves come in two grades depending on the speed of cutting desired and the type of work. The claim is made that the design of the lap and the use of a standardized abrasive render unnecessary highly skilled labor and lengthy experience.

The lap has a floating shank and an expanding device for adjusting to size as well as for taking up wear of the soft metal which is charged with the abrasive. It is also claimed that while the lap is expanded a diameter is kept constant over the whole length assuring a true bore free from taper and bell mouthing.

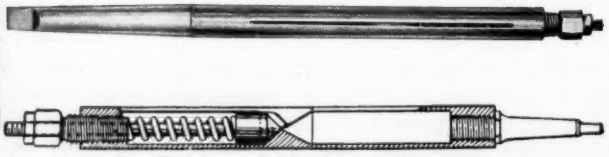
The soft material is said to prevent any of the abrasive remaining imbedded in the surface being lapped. Another advantage claimed for lapping is that it renders unnecessary the running in of new engine or engines to which pistons and rings have been fitted. Purchasers of cars ordinarily are cautioned to drive slowly during the first 500 or 1000 miles to prevent seizing of the pistons or bearings while they still are imperfectly "worked in." This precaution is rendered unnecessary by lapping. The R and C external lap was designed for use in lapping crankshaft bearings. The crankshaft bearings are left 0.0001 in oversize and are lapped to size within 0.0001 or 0.0002. The connecting rod bearings are finished by means of hardened and lapped plugs and are then absolutely interchangeable, it is claimed.



R and C cylinder lap



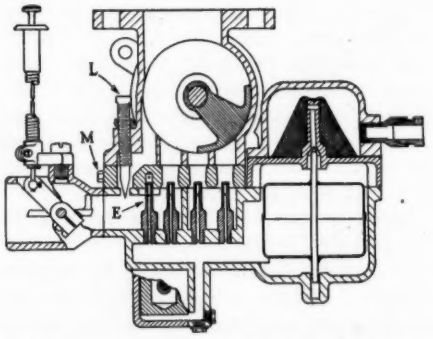
R and C external lap



Small internal lap for tool rooms

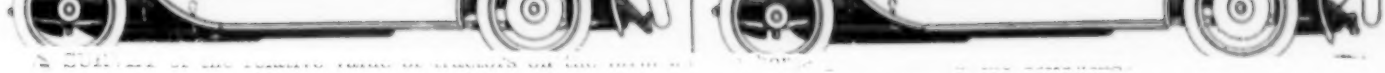
A partially enclosed body with a non-collapsible roof that extends the full length and is attached at the front to the windshield [illegible] behind the seat. The length of the frame behind the driver's compartment is 144 in.

This truck is designed to have a speed range up to 25 miles per hr. on pneumatic and 18 miles per hr. on solid. The engine develops 39 hp. at normal speed. Ignition is by magneto, cooling by centrifugal pump and lubrication by combined pump and splash system. The clutch is a Fuller, multiple disk, dry plate type lined with Raybestos. The gearset provides four forward speeds and one reverse and the rear axle is a Clark, model 2-D internal gear type providing an 8 to 1 reduction. The Hotchkiss drive system is utilized. The service brakes are on the propeller shaft, the brake drum being 8½ in. in diameter by 4 in. width. The hand or emergency brake is an external contracting type on the rear axle. The front springs are 44 by 2¼ and the rear, 52 by 3½. The wheels are steel and the tires either pneumatic 36 by 6, front and 42 by 9 in. rear, or solid, 36 by 4 in., front and 36 by 7 in. rear. The regular equipment includes solid tires, oil lights, hand horn, bumper, towing hooks and tools and sells for $2795 f.o.b. Detroit.



A NEW MULTIPLE JET CARBURETER

A new carbureter known as the Omac Constant Unit, has recently been placed on the market. It consists of a base casting containing a number of jets of various sizes and a direct acting float with needle valve at the top. A venturi plate in which is formed a number of venturi passages equal to the number of jets is fitted between the base and the flange casting which attaches to the manifold. In the flange casting is a sector shaped throttle arranged to progressively uncover the various venturi openings and thus bring the jets successively into operation. There are from two to four jets and tubes in each range, interdepending upon the size of the carbureter. Made by the Jennings Corp., 404 N. Richland st., Pittsburgh.



made by the United States Department of Agriculture.

Analyzed, the survey's preliminary report shows that 75 per cent of the 354 farm owners, expressed their opinion that their tractors were more profitable than horses from a viewpoint of total results obtained.

The cost of using tractors for drawbar work on 354 farms of an average acreage of 500 acres, was $484 for the year, or $1.60 per working hours. In addition to the tractors used in the work, these farmers kept an average of 8.3 head of workstock. The cost of the workstock for the year was $541.

Based on a total of $1,025 for drawbar power, the figures show that the tractors furnished more than half the power, for 40 per cent of the cost of the entire drawbar work.

There were great variations in the practices and costs on individual farms and the results indicate that often the cost of using the tractors and keeping the workstock was excessive for the amount of work done.

As a result of the survey, the department will begin work at once determining exactly what work a farmer should use his tractor for and what work could most profitably be done with horses. Many tractor owners, it was found, had no definite idea as to exactly what work they should use their tractors for and what should be done by horse.

Tractors Reduce Horses and Labor

The average cost per crop acre was $3.37 per year for drawbar power for all the farms. This cost ranged from $2.21, as the average for a fourth of the farms with lowest cost, to $4.76 for the fourth of the farms with highest costs.

The tractors had been in use for 23 months on an average and the first cost had been $1473, about one-third higher than the present price of tractors of the same size and type. During the year covered by the investigation, the cost of fuel and oil was also somewhat higher than at present. On account of these lower prices it is estimated that the present cost of operating tractors purchased at current prices would be something like 25 per cent below the 1921 cost on these farms.

The effect of the addition of the tractor to the farm equipment was shown in changes recorded after the purchase of the tractor. On an average, these farms had been increased by 50 crop acres and there had been a reduction of 1.4 months in the amount of regular labor used. Three and one-third head of workstock in addition to those on hand at the time of the investigations would have been necessary if the work had all been done with horses. The tractor owners considered that they needed in addition to their tractors an average of only 6.5 head whereas they were actually keeping 8.3 head.

Effect of Use of Tractors on Power Costs

There was a net increase of $206 per farm in the combined cost of power and labor due to the use of the tractor, after deducting the cost of keeping the workstock which had been displaced and the value of the family and hired labor saved.

Had all the surplus horses been sold, there would have been a further reduction of about $115 per farm in the cost of horse labor. On many of the farms there had been a reduction of feed for workstock due to the use of the tractor and if this had been taken into account a further saving of about $47 per farm would have been shown.

The analysis of the cost per acre of power and man labor

Plowing spring and fall with horses	1.88	per acre
Listing with tractors	1.10	per acre
Listing with horses	1.03	per acre
Disking (tandem disk) with tractors	.91	per acre
Disking (tandem disk) with horses	1.05	per acre
Drilling with tractors	.68	per acre
Drilling with horses	.52	per acre
Drawing binder with tractors	.87	per acre
Drawing binder with horses	.56	per acre

A survey of 85 farms where tractors were used and 85 farms where tractors were not used, both farms consisting of comparable size, shows that the cost of drawbar work on the farm where only tractors were used was $701, compared with $1,025 where tractors and horses were used.

There was an average of 10.5 head of workstock on the farmers where horses and tractors were both used. One horse was needed for each 33 crop acres, while the tractor owners were keeping one for each 42 crop acres and needed, in addition to their tractors, only one for each 54 crop acres.

Majority Say Tractor is Good Investment

The owners' opinion regarding the use of tractors showed that 75 per cent of the farmers interviewed believed that their tractors would be profitable investments, and 72 per cent of them intended to buy others when needed. The principal advantages mentioned were the ability to do more work in a given time, and the saving of horses in hot weather. Among the disadvantages, the first cost and depreciation and the running expenses were mentioned most frequently. The tractor was used as the primary source of power for field work by 59 per cent of the owners, while 41 per cent used the tractors as supplementary to horses. In 21 per cent of the cases, the tractor owners believed that the tractors had been responsible for some increased yield per acre.

646-MILE SEALED BONNET CONTEST HELD IN FRANCE

A 646-mile Sealed Bonnet Contest from Paris to Nice under the auspices of the Automobile Club of Nice, was staged recently.

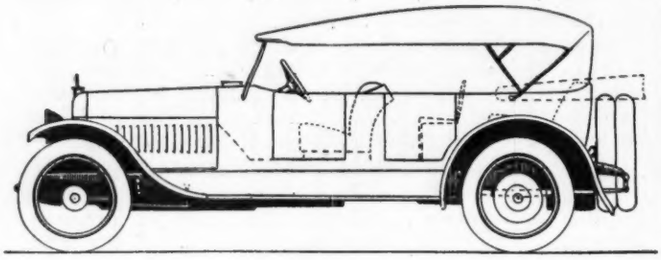
Entries in this event had practically every unit of their cars sealed, and in addition, seals were placed on the bonnet, it thus being necessary to make the run to Nice without doing anything on the car other than filling up with petrol and oil. The stages were Lyons, Marseilles and Nice, with a day's halt at each of the former towns, during which the cars were kept under official control.

Of the 16 starters, comprising all types of cars, one fell out on the first stage, another met with an accident on the last stage, two others had to break their seals and were penalized and 12 checked in at Nice with perfect scores. The successful machines comprised a team of three 10 h. p. standard four passenger Fiats, driven by Rouillard, Bradley and Mouzin, A Vermorel, De Dion Bouton, Itala, Cadillac, two Voisins, a Peugiot, Farman and a Lancia.

At the conclusion of the Sealed Bonnet Run, the successful cars were eligible for the La Turbia hill climb. This hill, which is near Nice, is historic, for, the first race was held over it 25 years ago when Andre Michelin, the tire manufacturer, won in a steam car. It is also one of the most difficult hills in Europe owing to its numerous sharp turns.

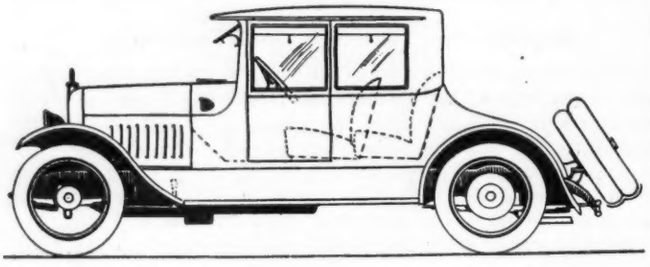
S. A. E. Standard Names for Body Types

The Society of Automotive Engineers committee on body names has reported to the parent society and the names given below have been adopted as standard by that organization.



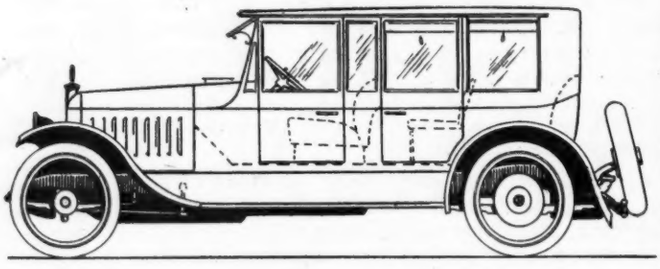
PHAETON

An open type body with two fixed cross seats for four or five passengers. Folding seats in the tonneau for two additional passengers are sometimes used. The conventional body has four doors and a folding top with removable side curtains. This car is commonly known as a touring model, but it was decided to call it a phaeton, as all types of cars are now used for touring purposes.



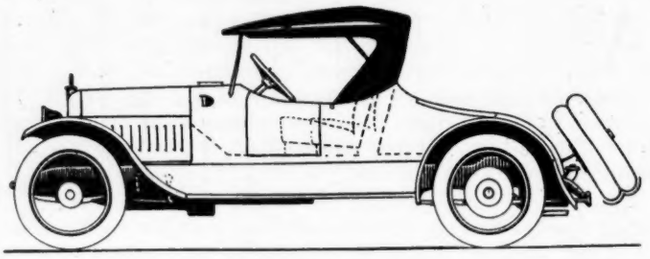
COUPE

An enclosed single compartment body with one fixed cross seat. This seat may be straight and accommodate two persons, or be staggered and accommodate three persons. With the latter arrangement, a folding seat may be placed beside the driver's seat. The conventional body has two doors and two movable glass windows on each side. The roof is permanent and there is a luggage compartment at the rear.



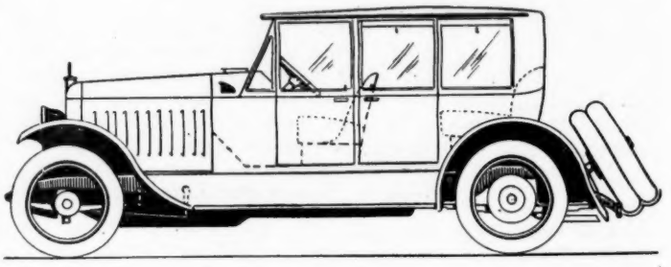
BERLINE

A body of the same general description as the sedan, except that there is a partition at the rear of the driver's seat that makes it an enclosed two-compartment body. Generally one glass window in the partition is made so that it can be moved horizontally or vertically.



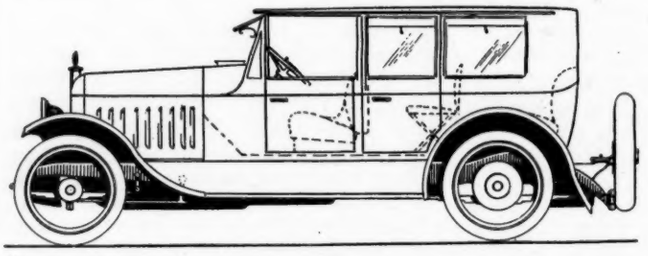
ROADSTER

An open-type body, having one fixed cross seat for two passengers and a space or compartment at the rear for luggage. Folding seats fitting into the luggage compartment are sometimes used. The conventional type has two doors and a folding top with removable side curtains.



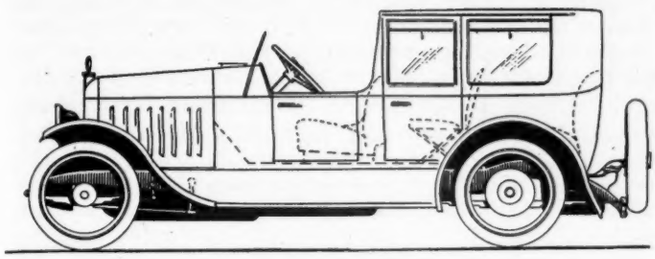
SEDAN

An enclosed single compartment body with two fixed cross seats for four or five passengers. Sometimes the front seat is divided by an aisle. Folding seats in the tonneau for two additional passengers are sometimes used. The conventional body has four doors, but some models have only two. There are three movable glass windows on each side and the roof is noncollapsible.



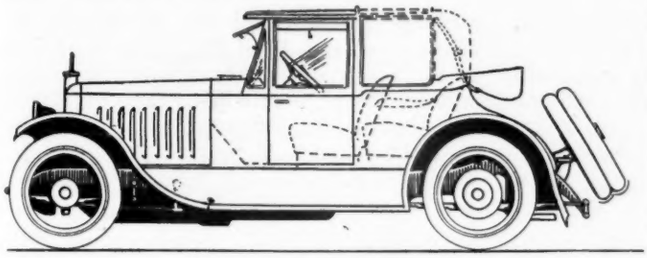
LIMOUSINE

A partially enclosed body with a non-collapsible roof that extends the full length and is attached at the front to the windshield. Only the rear portion of the body up to the partition at the rear of the driver's seat is fully enclosed. There are two low doors and one fixed cross seat for two in the forward section. Folding seats for two additional passengers are sometimes used. There are two doors and two movable glass windows on each side.



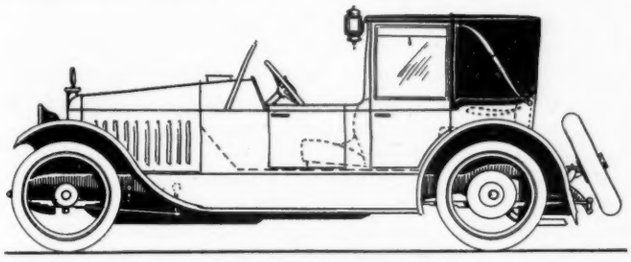
BROUGHAM

A body of the same general description as the limousine, except that the non-collapsible roof extends only over that portion of the body that is entirely enclosed.



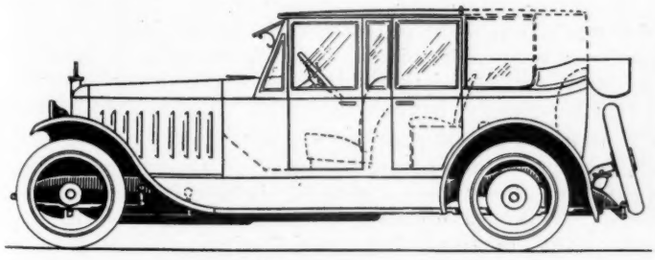
COUPE LANDAULET

A body that bears the same relation to the coupe as the sedan landaulet bears to the sedan.



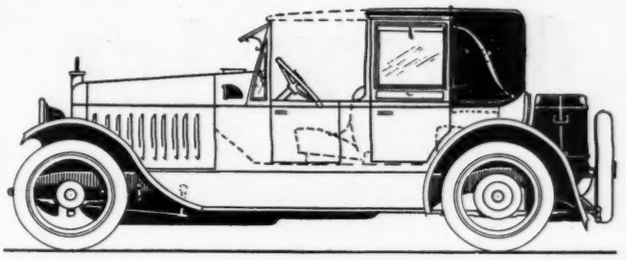
LANDAULET

A body similar in appearance to the brougham, except that the enclosed section is shorter from back to front and the roof is fully collapsible up to the partition at the back of the driver's seat. The body has one fixed cross seat in the rear section for two or three passengers, two doors made with either flappers or hinged upper parts and glass windows in the doors only. The rear quarters, back and top, are covered with leather or fabric. There are outside joints to support the top. This body is similar in some respects to the cabriolet. The enclosed portion is somewhat shorter and consequently there is no room for collapsible seats.



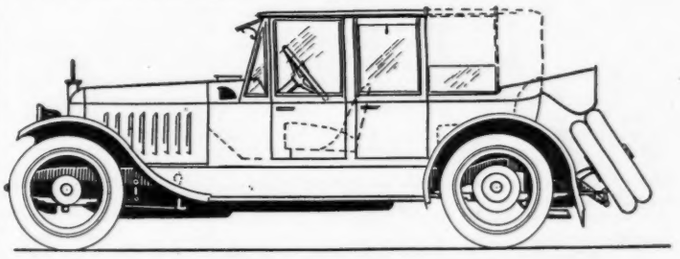
BERLINE LANDAULET

A body that bears the same relation to berline as the sedan does to the sedan landaulet.



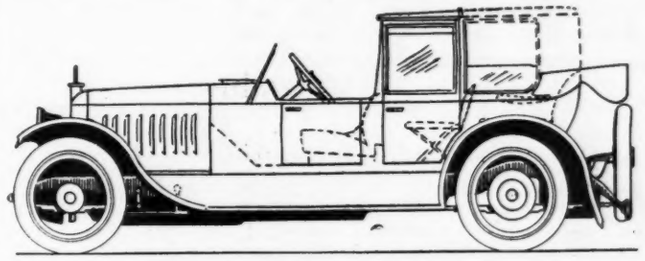
CABRIOLET

A body similar in appearance to the brougham and having the general characteristics of the landaulet, except that the falling pillar hinge is set back from the pillar line. The rear section is, therefore, longer than that of the landaulet. The body has one fixed cross seat for two or three, and folding seats on the partition for two additional passengers. Doors in the rear section are made with either flappers or hinged upper parts, and there are glass windows in the doors only. The top is fully collapsible, including the partition at the back of the driver's seat. The upper rear quarters, the back and the top are covered with leather or fabric and, in the conventional design, the top quarter at both the sides and the back have larger radii than other types of closed bodies. There are outside joints to support the top.



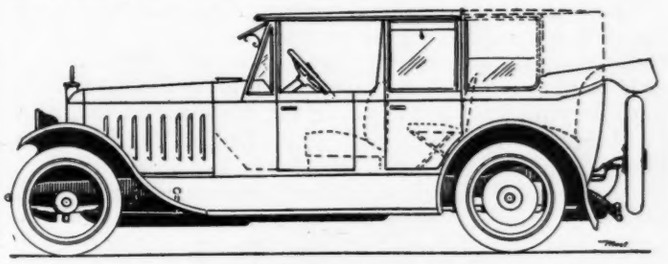
SEDAN LANDAULET

A body of the same general description as the sedan, except that the top back of the rear doors is collapsible.



BROUGHAM LANDAULET

A body that bears the same relation to the brougham as the sedan does to the sedan landaulet.



LIMOUSINE LANDAULET

A body that bears the same relation to the limousine as the sedan landaulet bears to the sedan.

MOTOR AGE

Reg. U. S. Pat. Off.
PUBLISHED EVERY THURSDAY

Vol. XLI Thursday, May 4, 1922 No. 18

THE CLASS JOURNAL COMPANY

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SUBSCRIPTION RATES

United States, Mexico and U. S. Possessions.....$3.00 per year
Canada ..... 5.00 per year
All Other Countries in Postal Union..... 6.00 per year
Single Copies.....35 cents

Subscriptions accepted only from the Automotive Trade

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.
Entered as second-class matter Sept. 19, 1899, at the post-office at Chicago, Ill., under the Act of March 3, 1879.
Member of Associated Business Papers, Inc.
Member of the Audit Bureau of Circulations.

The Safety Problem

THE municipality of Chicago is just now indulging in one of those automobile safety sprees that American municipalities appear to regard as privileges and which doubtless do good and probably avert some accidents. Such agitation puts fear into the minds of some drivers for the time being and it brings other drivers to recognize the fact that others have rights on the roads which they travel in high powered machines.

The unfortunate part of these outbursts is that they are seldom founded on the proper fundamental study of the situation that exists. Just as in the present case in Chicago, those who are leading in the indulgence that is occupying so much space in the daily press, hold the "reckless" driver up as the cause of all of the fatalities and the inference is given to the unthinking public that when this man is curbed, all will be well and the future of the streets is assured to all concerned. In one regard, the Chicago campaign is better than many others, in that the word "reckless" is used as the adjective describing the objectionable driver rather than merely terming him as a speeder. However, one newspaper in describing this campaign begins each day's story with words "Watch your speed," leaving the inference with the reader that the newspaper, at least, believes that speed alone is to blame for accidents.

The really sad part of all such campaigns, is that those in authority make no effort to determine what are the causes of the accidents in that territory which they would render safe, or in any part of that territory. In a city like Chicago different conditions exist in the several sections of the city and the study of the accidents should be zoned in order that the traffic regulations would fit the local conditions. Each accident that is reported should be investigated and then these persons who set about to stop accidents would be able to know where they should strike to do the greatest amount of benefit. So far, in the Chicago campaign there has been no statement as to the cause of the great number of accidents during the year 1921, on which fact this campaign is based. The passenger car driver is being made the goat of the campaign, apparently because he is the most numerous, the more speedy, the more spectacular and the more able to pay fines and make the records of the court look up. It apparently has not occurred to those in charge of this life saving movement to investigate last year's accidents and determine whether it was the passenger car driver, the truck driver or the pedestrian that caused the accidents. Some surprises might result from such an investigation and it might indicate the policy of police court fines to be quite ineffective.

The Chicago campaign is apparently based on the very excellent results in Detroit, where automotive vehicles are better understood than in most cities and where the city authorities are not ashamed to ask automotive men to consult with them on automotive subjects. It is true that there was a police court campaign in Detroit, but that was only a part of the general campaign. The fundamental part of that campaign was education and this part of the work was conducted through the schools, moving picture theaters and other means that reached many persons and taught to children and others unfamiliar with traffic rules, the rights and privileges of the streets. This is the important part of the Detroit work and through it more lives have been saved than through the police courts. This plan, where properly undertaken and carried out, will make a heavy return in life saving.

It is not the fault of the motor car driver that he has little regard for speed limits and other traffic regulations. Usually the laws on this subject are almost silly and the police execution of them inefficient. In Chicago, for instance, the motorist does not know which of the regulations are for his restraint or which are to be broken at will. It is not the fault of the motor car driver that the police do not give sufficient time for the pedestrian to cross the streets between shrills of his whistle and if he would escape being "bawled out" he must almost run down some pedestrian. It is not the motorist's fault that police permit the parking of cars on the wrong side of the street in certain communities, nor is it the driver's fault that the city planners, in their wisdom, have seen fit to make only certain streets fit for driving for his vehicle.

The driver who is conscientious and who respects the rights of others knows that he is not immune from police call downs when he tries to conduct his vehicle as he thinks it should be, especially if he tries to give a pedestrian the right to cross the street.

It is perfectly true that the driver is at fault in many ways, but a better understanding of the traffic rules by those who enforce them would cure a good many of these faults.

It is time that some understanding was put into traffic ordinances and rules and that the cures that are

undertaken should be founded on study, not fancy. To get an understanding into these rules there must be invited into the conferences from which these ordinances and rules emanate, men who understand the automotive vehicle. Most such men are now engaged in the industry, either as the operators of large fleets, as dealers or as manufacturers. The idea that such men would make rules favorable to the motorist is silly, because these are the men who have most at stake in the successful operation of vehicles. Also these men know full well that accidents must be lessened or their merchandise will suffer. The industry has more at stake in this problem of accidents than any other persons and if they are not invited to these conferences they should demand the right to be heard.

Traffic and safety has been left to amateurs long enough in most communities.

Can You Afford to Be Without— *Taps, Dies and Reamers?*

THE above question would almost seem to be out of place in a message directed to those persons engaged in the maintenance work on automotive vehicles because in this day and age we have come to look upon the maintenance station as a place tooled up to handle practically every sort of repair operation. And yet, it is possible to run across shops, many of them conducted by dealers in average large cities, and find these shops without a good assortment of taps, dies and reamers. Some of them have only a handful of these important tools.

The work in the shop is of such a varied nature that in most of the operations the mechanic will find need of a tap, reamer or a die. Always where bushings have been installed the holes must be reamed. Piston pin bosses must be reamed for oversized pins. Dozens of places on the chassis call for reamers when worn parts are to be replaced with new ones.

Bolts are stripped of their threads, studs are twisted off and new ones must be made, at the same time the hole must be drilled and tapped for the new stud. Many similar operations can be cited, all of which call for tools of the type mentioned. It hurts shop morale when a mechanic tries to cut new threads on a bolt with a nut, because he has not the die with which to do the work. It is unworkmanlike too, for a man to try to file out a hole in a bushing when such a hole should be reamed to insure concentricity and accuracy.

A set of taps and dies and reamers will soon repay the expenditure in the average automotive shop which seeks to serve to its best ability.

The Value of a Reputation

FINANCIALLY, if from no other point of view, the most valuable asset of the automotive mechanic is the possession of a reputation. The reputation a man acquires for skill in any line of endeavor is his great weapon in his effort for advancement and success. We believe that much good can come out of a state registration system for automotive mechanics but believe that classification by a state board would, at the present time at least, result only in confusion. One big reason against state classification of mechanics is that automobile construction is so diversified as to render the just classification of any man a thing very difficult to secure.

While we are dwelling on the "doctor-trouble-shooter" analogy we must consider that although doctors are licensed by the state laws they are not classified as to ability by any state organization. Which brings us to the function and purpose of the various associations pertaining both to industries and professions. The Bar Association for lawyers and the various medical associations have done more to raise the standards of practice than the state control.

Doubtless there is an imperative need for some sort of association of automotive mechanics which could include among its functions the classification of its members into grades according to their experience and proficiency.

In nearly every instance where the employer of mechanics has a single scale of pay it is due to ignorance on his part of the first essentials of the business in which he is engaged. P. M. Rupert, in a letter published in MOTOR AGE last week speaks of men of widely varied proficiency working side by side and both receiving the same wages. It is difficult to imagine how such a condition can exist for any length of time in any particular institution.

Perhaps in no other line of work has the mechanic the opportunity to show his individuality as he has in the automotive maintenance business. He has an opportunity to build up a clientele of customers and unless his superiors are blind they must notice this and at the same time observe the work of the man working beside him. While the inefficient and inexperienced man at his side is trying to conceal his inefficiency from the boss and the public, the proficient man is building a reputation for himself. He can cash in on this reputation in many ways, and because of the very fact that there are many classes of mechanics of varying degrees of proficiency, the really superior man has extensive opportunities for advancement.

An Automotive Mechanics' Association would be of benefit to the maintenance industry and could bring about a betterment of conditions where betterment is necessary. If such an association were formed along the correct lines it would establish within itself a much needed employment department which would investigate and list all the good mechanics and consequently furnish the class of men which is being demanded by all rightly conducted maintenance shops. The fact that really good men are rare is of itself proof that there are incentives in the business and the trail of these incentives leads to whatever position is most attractive to the individual. This is no visionary statement and refers to the many service managers, salesmen and maintenance station owners who rose to their positions from the shop, through hard work and study.

A Customer Appeal

FOLLOWING the successful appeal to dealers through the "Ask 'Em to Buy" phrase and education, the Merchandizing Department of the Automotive Equipment Association has suggested another phrase as follows:

"Full Service From Your Car."

This is a suggestive phrase and can be used by the dealer in many ways in making a direct appeal to the motor owning public. It can be used as the keynote for advertising for any useful accessory and especially will it be effective in selling maintenance. It can be turned directly to advertising shop equipment for the overhaul of the car or any part of it. Such effective precision equipment as the maintenance dealer installs is especially for the purpose of getting full service from the cars of those who patronize that establishment. Also it applies directly to the sale of all protective and convenience devices.

Production Approaches Capacity

April Automobile Output Largest In Any One Month

Total Figures Not Available, But It Is Believed New Record Was Made

Detroit, May 3—The month of May will be the biggest production month the Detroit district has ever known. Orders now on hand in most plants far exceed the possible output for the month and new orders are coming in every day. Extra shifts will be resorted to in all plants to keep production to its highest possible point. In the meanwhile, shipments will be apportioned throughout the sales territory. In an effort to bring the April shipments as high as possible and to cut down the number of orders that would have to be carried over into May many of the plants worked Sunday.

NEW YORK, May 2—Production of motor vehicles in April closely approached a record if it did not actually establish one. It may be found when the figures are compiled, that more passenger cars and trucks were produced than in any single month in the history of the industry. It is practically certain that the record for carload shipments was broken. The highest carload shipment figure ever recorded in one month was just under 30,000. The revised total for March was 27,380 and April ran considerably in excess of this figure. Whether a new mark is set will depend upon the number of cars driven away from the factories.

Running at Capacity

The only possible deduction from these production figures is that the automotive industry is running at capacity. For that reason any material increase in production will be impossible this month. It can be stated definitely, however, that May will be as good as April. Predictions beyond that point would be hazardous, but it would be surprising if there were not a seasonal decline in the third quarter. Nothing like a slump is probable and it is not likely that production or sales will fall below the level of March, which was an exceedingly good month.

The recovery in the parts branch of the industry has been almost as rapid as in the passenger car field. Sales of parts and accessory manufacturers for March were the largest in more than 18 months and ran about 30 per cent ahead of February. April will show a further substantial gain.

Truck plants are booming ahead and one of the most encouraging signs of continued good demand is found in that fact that a sales contest for the first three months of the year, conducted by one of the large manufacturers of light trucks, was won by its branch in St. Cloud, Minn., rather than by one in any industrial center.

Predicts Increase of 200 Per Cent in Truck Sales

By M. L. PULCHER
President, National Assn. Motor Truck Industries

DETROIT, April 29.—At the rate truck orders are coming in to the manufacturers of commercial vehicles, 1922 sales are going to be more than 200 per cent of 1921. This will mean that over a quarter of a million new trucks will go into service this year in the United States.

GOODYEAR KEEPS OLD PRICES

Akron, O., May 2—In the face of persistent rumors that tire prices would be increased May 1, the Goodyear Tire & Rubber Co., at sales conferences of branch and district managers and field representatives, announced a continuation of its old price schedules on practically all lines of tires. The company announces introduction of a new line of cross-rib tires to be known as the Wingfoot tires. These tires will sell slightly below the standard cord tire lists.

FOX STARTS PRODUCTION

Philadelphia, April 29—The Fox Motor Co., of Philadelphia, has started production of the Fox air-cooled car. Following the first showing of the car at the recent automobile exhibits, agency contracts were made and the total volume of business booked to date is about $2,000,000.

FORD INCREASES DISCOUNT

Chicago, April 29—The Ford Motor Co. has increased its dealers' discounts on cars and tractors. The discount on cars is now 20 per cent instead of 17½ and the discount on tractors is 25 per cent instead of the former discounts of 17½ and 5 per cent.

HUDSON-ESSEX CONSOLIDATION

New York, April 28—Plans have been completed for the consolidation of the Hudson Motor Car Co. and Essex Motors, Inc., by the formation of a new company capitalized at 1,200,000 shares of stock of no par value.

DORT PRICES INCREASE

Flint, Mich., April 29—The price of Dort touring and roadster models has been increased from $865 to $885, effective May 1.

General Motors Acceptance Issues Book of Operations

Stockholders Shown That Firm Is 120th Bank of United States

NEW YORK, April 28—The importance of the General Motors Acceptance Corp. in the selling systems of the corporation is emphasized in a booklet, summarizing its operations, which is being sent to all stockholders. The booklet is prefaced by a letter addressed to stockholders by Pierre S. du Pont, president of General Motors and chairman of the board of the E. I. du Pont de Nemours & Co., one of the largest industrial organizations in the world.

In his letter duPont gives expression to a conclusion which the automotive industry as a whole has been slow to grasp. This is that "the automobile is the largest unit of merchandise sold for cash to the individual consumer," and that "the merchandising of the automobile is upon the threshold of transition from a cash to a credit basis." He adds a word of credit to the specialized financing companies which have done financial work in the automotive merchandising to supplement credits from local banks.

The booklet gives some surprising figures regarding the General Motors Acceptance Corp., which, it says, now ranks 120th among the banking institutions of the United States from the viewpoint of capital, surplus and undivided profits. Since its inception early in 1919 to April 1, 1922 the corporation has financed under its retail plan 146,937 cars, trucks and tractors and 102,074 under the wholesale plan. This does not include the operations of the foreign department or the financing of other General Motors products.

As of Dec. 31, 1921 the company shows total assets of $31,933,965. The total amount of financial accommodation extended since its organization has been $227,743,664 divided as follows: Foreign $27,897,700; retail $107,802,979; wholesale $92,042,985. This means that it has financed General Motors cars of a retail value in excess of $300,000,000.

VELIE WINS CLIMB

Moline, Ill., April 29—The Velie Motors Corp. has been informed by Harry A. Lord of its Los Angeles agency that on April 18 a Velie Model 58 stock touring car with Walter Lord driving, lowered the Mt. Wilson Climb record from 38 minutes to 27 minutes and 52 seconds, thus winning the Los Angeles Express Cup.

Mt. Wilson road is nine and a half miles long, attaining an altitude of 6,000 ft. with 144 turns.

Sales Continue to Increase

Legality of Used Car Price Data Questioned by State

Wisconsin Attorney General Declares Associations' Activities Violate Laws

MADISON, Wis., May 1—The Attorney General of Wisconsin has declared illegal organizations and associations of automobile dealers, the purpose of which is to establish prices to be paid or allowed on used cars.

In an official opinion, Attorney General William J. Morgan declared such combinations to be a clear violation of Wisconsin's anti-trust statutes. In his opinion Attorney General Morgan indicates that if the nine organizations in Wisconsin engaging in the practice do not dissolve he will institute legal action against them for violation of the state's anti-trust laws.

The action of the attorney general followed considerable investigation under the direction of G. F. Clifford, Green Bay attorney. Among the facts disclosed was a list price used by the members giving rates to be allowed on every make car and model.

The association particularly assailed by the attorney general in his opinion is an incorporated non-stock organization. Morgan's charges against this alleged combine are that its purpose is to "collect reliable trade information and disseminate it among the members."

Members, he says, may be discharged or expelled for violation of their corporation rules. Each member is given a book containing estimates by dealers of the "reasonable value" of models for five years back in exchange on a new car.

These figures, Attorney General Morgan says, do not represent the collection of any statistics, but are rather certain dealers' estimates of what should be reasonably allowed for a car.

The book, according to the Attorney General, containing the prices, shows clearly that "it is at least used or contemplated being used as a price fixing medium and to a considerable extent to determine the allowance on used cars of the particular models."

Attorney General Morgan's condemnation of the practice is contained in these paragraphs from his opinion:

"From the testimony of several dealers it is admitted that the natural effect of such a combination would be to eliminate as to the allowance on used cars and that it would ultimately result in arriving at a more or less definite allowance for used cars.

"While we appreciate that the automobile dealer at present has a problem to solve with reference to used cars, especially in view of his effort to keep the manufacturer going and to satisfy a certain class of customers who have been educated up to the idea of purchasing a new car whether they need it or not, yet this problem in fairness to the public must be solved consistently with existing principles of law and existing statutes applicable to combination in restraint of trade."

A conference between Wisconsin dealers and the attorney general has been held and the matter of dissolution of the association put up to the dealers.

Milwaukee, May 1—Thomas C. McMillan, of the Overland Wisconsin Co., Milwaukee, president of the Milwaukee Automotive Dealers' Assn., when apprised of the attorney general's action, said: "There is no intention on the part of our association to conflict in any way with the anti-trust laws of the state or to act in restraint of competition. We have never fixed prices or attempted to do so and stand ready to co-operate with the attorney general in conducting the association's affairs in accordance with proper business practices."

FORD MAKING BATTERIES

Detroit, April 29—Ford Motor Co. has started the manufacture of batteries on a scale which will permit it to equip a certain proportion of its cars and trucks with batteries of its own construction. Officials declare that the manufacture of batteries is in the nature of a test and that it is not the intention at least for the present, to manufacture all batteries for the company's requirements.

The battery division is in the Highland Park plant which also houses other experimental divisions, notably a section which is now producing glass for windshields for Ford cars. The battery is said to follow customary practices and to be about the same general character as the batteries which have been used as standard equipment on Ford cars.

REPUBLIC MAKING BUSSES

Detroit, April 7—Republic Motor Truck Co., Inc., has organized a public utilities division under Ralph M. Sparks, to merchandise the Republic Knight-Motored bus. This department will devote itself exclusively toward merchandising the bus to railway lines which have a problem of feeder service to meet.

FRANKLIN'S LARGEST APRIL

Syracuse, N. Y., April 29—The Franklin Automobile Co. states that its orders for delivery this month have averaged 65 cars a day and that the month will be the largest April in the company's history.

New York Distributors See Good Business Ahead to June

Expect Seasonal Falling Off and Mild Summer Sales; Fall Depends on General Conditions

NEW YORK, April 28—There is no doubt that passenger car sales in the metropolitan district when finally totalled for April will exceed the March record, which was the largest since the spring of 1920. May business also is bound to be good and the most conservative distributors look for a continuance of spring sales up to the end of June. They hardly expect May to be as big a selling month as April and they look for a logical seasonal falling off in June. Early indications are for a normal summer business, with the prospects for fall dependent upon the general trend of business.

Deliveries in April have been heavy, virtually all dealers running 25 per cent ahead of March and others 40 per cent more. The new car registration report for April will show a big gain over March.

In New York City April buying has lacked the "snap" which prevailed in March. March was an exceptionally mild month and the urge to get out in the open sent thousands of people to the salesrooms eager to obtain new cars. April weather has been cold and generally wet and buying has been built more on sales activities of the metropolitan staffs than on the spontaneous desire of buyers. Outside New York City itself, however, March did not show any such momentum and the big volume of business, as usual, will be in April.

PARKER TRUCKS REDUCED

Milwaukee, Wis., April 18—Substantial price reductions are announced by the Parker Motor Truck Co. The list follows:

			Old Price	New Price
Model J	20	3½ ton	$4400	$3950
Model M	20	5 ton	5500	4850
Model C	22	1 ton	.....	1875
Model G	22	2½ ton	.....	3200

Model F 20, 2 ton, will be discontinued.

TRACTOR PRICE REVISIONS

New York, April 28—Price revisions have been announced by the different manufacturing companies on the following tractors:

	Old Price	New Price
Heider C	$900	$995
Townsend, 10-20	750	800
Fitch	.....	1850
Mohawk	785	650
T. B.	715	500

Farm Equipment Manufacturers Look For Big Sales In Summer

Makers Have Already Experienced An Increase In Sales; Farmer Is Ready to Buy

CHICAGO, April 29.—Recently in conversation with a man who devotes most of his time to a study of the prospects and future sales of farm equipment, this question was asked of him:

It is history that the first quarter of automobile manufacture and sales was surprisingly good; it is evident from present circumstances that the second quarter will be very good; the third quarter will probably depend largely on rural sales; what in your opinion is the prospect for these sales?

The answer was in substance as follows:

"The farm equipment manufacturers are hoping for a large volume of retail trade during the summer. Without exception the manufacturers believe that the farmer is in a different buying humor from that of last year. These manufacturers have already experienced a considerable increase in sales. The rising price of farm produce has encouraged the farmer and he is in a more receptive attitude than he has been for some time.

"Prices of automotive vehicles and farm equipment are much more to his liking than they have been. He is almost convinced that the bottom prices for the present have been reached. I see no reason why the farmer should not make the third quarter and automotive manufacturing a success.

"Frankly, although I am primarily interested in farm equipment sales, I would rather be in the automobile business this summer than in the farm equipment business. The direct returns from an automobile or a truck, are more evident to the farmer than the direct returns from the farm tractors and improved farm machinery. The reasons are observed. The automotive vehicle appeals more quickly and the benefit of speed is more observed. Besides it has been in use longer than the tractor and special farm equipment.

Tractor Makers Hopeful

"In conclusion I will say that the farm equipment manufacturer is hoping rather than expecting, and if I were an automotive manufacturer I think I would be definitely expecting."

The same question as above was put to the sales managers of two large tractor manufacturers. Their replies are as follows: G. B. Gunesysan, advertising manager of the J. I. Case Threshing Machine Company, says:

"Your letter of the 10th concerning the business outlook in the automotive field has been received. This company, as we believe all other companies in the farm implement and the automobile industries, has noticed a considerable change for the better in business. Not only has there been an actual improvement in business, but the outlook is ever so much better than it has been for a long time.

"As to the outlook after June 30th, this in our opinion will depend very much upon the market for farm products. If present prices on these products prevail, we believe business will steadily improve throughout the season."

W. S. Frederickson, general sales manager of the Hart-Parr Company, says:

"Without question there is going to be a great deal more tractor and automobile business this fall with the farmer than there was last year. Right now he is feeling much better than he has for eighteen months. On the other hand, the burnt child is afraid of fire. The farmer appreciates that not very long ago he was on a spending orgy and every dollar that he is going to spend this fall is going to come hard for the salesman who is selling him.

"It is our honest opinion that the farmer this fall is going to patronize low to medium priced tractors and automobiles and the manufacturers making a high priced car or tractor have no chance for business with the farmers this fall.

"The whole of the tractor and automobile business would be benefited if some of the standard manufacturers would start a small increase in retail prices. Something has to be done without a question, even with the present prices, to get the farmer to understand that things are at rock bottom. Possibly this can be done by some of the farm publications over the country in comparative costs, pre-war and present.

Adopts "Locomotive" Idea as Maintenance Sales Aid

MINNEAPOLIS, April 29—Owens Motor Sales, St. Paul, has adopted the locomotive idea as an advertisement for its trouble service. The locomotive is built on a Ford one-ton truck chassis with the regular wheel base. At the rear is added a pair of trailer wheels. The locomotive drives and brakes on all four of these wheels. It has an electric hoist operated from the Ford starter on a worm, which obviates locking the hoist. It has a regular chime whistle operated from the exhaust and a locomotive bell and large headlight with smaller side lights operated from the battery through the hand rails on either side of the boiler. This boiler is made of 16-gage steel by Berg Bros. Manufacturing Co., Minneapolis, which was so proud of the job it placed a 16 carat gold name plate on the boiler head.

The engineer's cab carries 5 passengers, so the unfortunate motorists who have to be picked up will travel in comfort out of the dust. A hundred pound pressure tank supplies air for tires. The locomotive is plentifully supplied with advertisements in red and blue letters, the signs over the cab being illuminated by electric spot lights. The exhaust is through the smoke stack, heightening the resemblance to a locomotive.

MEMPHIS DEALERS ELECT

Memphis, Tenn., April 28—Owen Lilly, president of the Lilly Carriage Co., distributors for Peerless cars and Federal trucks, was elected president of the Memphis Automobile Dealers' Assn, at its annual meeting April 10.

Other officers elected were Frank D. Graham, vice president; Fred M. White, Jr., treasurer; and W. H. Osoinach, secretary. The directors for the ensuing year are: S. H. Butler, A. J. Clayton, Jos. M. Connable, Frank D. Graham, Owen Lilly, Thos. H. Stuart, and Fred M. White, Jr. The retiring president, Steve H. Butler, reviewed the activities of the association.

Chicago Dealers Optimistic; Some Have Oversold Quotas

Business Good; Expect Improved Summer Sales; Truck Market Better

CHICAGO, April 29—Retail sales of automobiles in Chicago and Cook county in April have been good, but not phenomenal. Dealers in some of the popular-priced and well established lines have exceeded their expectations. There has been an unusual demand for the enclosed models and some dealers are having difficulty in getting enough of these cars to make prompt deliveries.

The best known cars in the high priced class also have been selling well. Dealers attribute this to the upward trend of the stock and bond market. "I look for our business to improve right through the summer," said one dealer who also indicated his faith in the continued improvement in the financial quotations.

In between the two classes of good business is a group of cars which have not yet acquired a distinctive place in the industry which are not moving well. Sales in some of these lines are gradually improving, however. The sale of used cars was stimulated by the Used Car Show of the Chicago Automobile Assn., which opened at the Coliseum April 26. All cars offered for sale at the show bear the approval of a committee of the association as to their mechanical condition.

Available figures indicate sales of 5109 new and used cars in four weeks of April as compared with 3717 new and used cars in four weeks of March, an increase of 37 per cent. These figures are based on the number of chattel mortgages filed to secure payments on cars sold on time.

Truck sales are very much better than for many months.

DIAMOND T PRODUCTION

Chicago, May 1—The Diamond T Motor Car Co. is now producing trucks at about 60 per cent of normal capacity. The output is gradually increasing to keep pace with sales which are showing considerable improvement. Officials of the company expect this year's business to be about as good as 1919. One of the large sales made recently by the Diamond T company was a fleet of 50 1½-ton trucks to a large baggage transportation company in Chicago.

ENTRIES IN EUROPEAN RACES

Paris, April 13—Twenty-eight cars are already entered for the first European 122 cu. in. race. This race which is to be held on a six-mile speedway now under construction on the suburbs of Milan, Italy, has been entered by teams of Fiat, Bianchi, Mercedes, Benz, Austro-Diamler, Rolland-Pilain, Heim, Sunbeam and Talbot-Darracq cars. A few other Italian entries are promised, bringing the total up to more than 30.

In addition to this 122 cu. in. speed contest fixed for Sept. 10, there will be a 91 cu. in. race on Sept. 3 over the same track. Entrants in this event will comprise Mercedes, Fiat, Talbot-Darracq, Chiribiri and others.

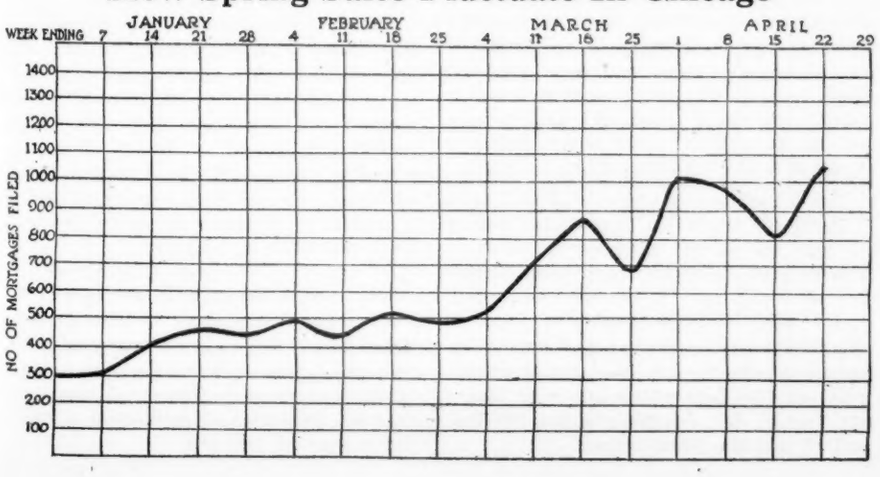
SOME PLANTS SHORT OF LABOR

Detroit, April 29—Increased production in automotive plants has absorbed practically the entire supply of skilled labor in this district. Some factories are having difficulty in obtaining common labor. An actual shortage of skilled workmen is reported in body plants. Many advertisements for wood working machine and other skilled operatives are being carried by Detroit newspapers. An increase of 4,500 men on the payrolls of members of the Employers' Assn. was reported last week bringing the total to 145,234 or within 50,000 of the peak in 1920.

DUNLOP TO START PRODUCTION

Buffalo, April 29—Production is soon to be begun at the $25,000,000 tire plant of the Dunlop company in the River road, Albert L. Kinsey, president of the Buffalo Chamber of Commerce, told the members of the Equality Club of the central Y. M. C. A. this noon.

How Spring Sales Fluctuate In Chicago



"One of a Thousand" Plan Enlists 187 In N. A. D. A.

Statistics Show Qualifications of Those Elected to Membership

ST. LOUIS. May 1—A bulletin issued by the National Automobile Dealers' Assn., with headquarters here, states that since the adoption of the "One of a Thousand" plan of membership there have been 271 applications for membership from 28 states and that of these 187 have been elected to membership. Action on a number of other applicants is pending.

In the bulletin, which is addressed to members, General Manager C. A. Vane gives some statistics about the membership. The following is quoted from the bulletin:

"The number elected have been in business on an average of 9.2 years apiece. The average life of the average American retailer is 7.5 years and the average life of the average automobile dealer is 3.5 years. Our membership then is composed of men who are better than the average for all merchants and who have been in business nearly three times as long as the average automobile dealer of the country.

"Now something about their financial stability. These members elected have an average minimum net worth of $100,000 and an average maximum net worth of $125,000. We feel that you will be interested in knowing these facts because then you can measure yourself by the high standards of your associates. Some of you have a net worth far in excess of $125,000, indeed we have a half dozen members whose net worth is given at $1,000,000. Some of you are less than that figure. But we told you that we were going to bring into this organization only the stable, financially capable and of course, personally responsible merchants of this industry. We just want to let you know how we are keeping that promise."

GOOD SHOW AT MEXICO CITY

New York, April 29—Successful sales of all classes of automotive equipment attended the annual motor show in Mexico City. Held under the auspices of the automotive division of the American Chamber of Commerce as a co-operative venture among the dealers in the Mexican capital, the exposition opened on April 16 and when the doors were closed after the week of exhibition, a total of 142 passenger cars, five trucks and ten tractors had been sold, with equipment and accessories to a total value of 800,000 pesos ($400,000.)

These results were announced in a cablegram from the Chamber of Commerce at Mexico City to El Automovil Americano, the Spanish automotive publication of the Class Journal Co.

Shortage of Parts, Materials and Skilled Workmen Felt at Detroit

Car Makers In Specialized Unit Field Are Affected Most; Wheel Makers Hit

DETROIT, April 28—Passenger car business in the Detroit district has progressed to a point where the already slender store of parts and materials has been reduced to the vanishing point in a great many instances and in some cases has been entirely wiped out. The big battle of the moment is not to get business, but to get material.

Passenger car makers again have stock chasers on the road in an attempt to speed up deliveries and many shipments of smaller parts and accessories are being ordered by express.

Car makers in the specialized unit field are particularly hard hit, for the shortages are not confined to any one unit. In other cases the body makers have fallen behind, but the serious shortage is with the specialized unit maker.

This shortage is most serious because of its origin in the basic metal and the impossibility of getting around the time required for treatment of the metal before it can be made up into the parts. A sudden shortage of malleable has been discovered in more than one plant and malleable stores cannot be replenished over night.

In the body making field the serious shortage is skilled workers. Newspapers here are carrying advertisements for men specializing in the various processes of body making but the ranks are very slow in filling. Some companies feel a shortage of space which will be overcome by the addition of new buildings and in the meanwhile body contracts are being sublet by manufacturers or placed elsewhere than in the crowded shops by the car makers.

The Timken Axle Co. is installing new equipment in several of its units to meet the onslaught of orders. Deliveries have fallen behind, it is admitted, but with the new equipment the company will get back to an even footing soon after May 1 and will be entirely caught up by May 15.

Continental Motors Corp. declares it is fully equipped to meet all delivery requirements but has been compelled to hold up shipments because of the non-delivery of other necessary parts to its customers. Shipments are being sent forward in the quantities that the makers of other units or bodies are capable of furnishing so that inventories may be kept balanced.

Fisher Body Corp. has plans fully made to build an addition to its former airplane body plant which has been practically idle since the war, which will give it an additional 1,000,000 feet of body manufacturing space in Detroit. Fisher will not admit being behind on orders and has not one on over time schedule or double shifts.

The extent of body demand may be gaged somewhat from the fact that one independent body company has gone into production on 17 new types of bodies within 10 days. Some time will be required, the company declares, before capacity production can be reached on the new work owing to the suddenness of the demand and the impossibility of getting skilled men quickly.

Other body companies report themselves as able to keep up to delivery requirements through employment of double shifts and overtime.

Incidental to the body situation, it may be reported that enclosed car demand is running 20 per cent higher than had been anticipated in most of the medium grade cars and consequently deliveries of finished cars are running behind because of failure to authorize releases sufficient to meet the demand. Enclosed car commitments must be made at least 90 days in advance, a prominent maker said, to meet deliveries on schedule. Inability to gage the extent of the spring enclosed car business, is responsible to a large extent for the rush in the body plants.

Interesting Decision In Suit Against Repairman

Hartford, Conn., April 22—Much interest attaches to a judgment just granted a woman in the court of common pleas in this city who sued a repairman who was to put her car in order. The woman was awarded $197.69. In her complaint the owner set forth the car was left with the repairman and she was deprived of the use of it for 20 days, and that during that time the repairman and his employes used her car for long trips which caused considerable damage to the machine.

FRAUDULENT SALESMAN

The attention of MOTOR AGE has been called to apparently fraudulent operations of a man posing as a salesman for the Universal Electric Mfg. Co. of Chicago. The Eagle Grove Storage Battery Co., Eagle Grove, Ia., wrote to the Electric Machine Corp., Indianapolis, stating that on March 31 a man giving his name as J. C. Engle and claiming to be a representative of the Universal Electric Mfg. Co. of Chicago contracted to sell the Eagle Grove Storage Battery Co. an Elmco Universal test stand and received a $40 deposit from the company.

The Eagle Grove company states that it has been unable to locate such a firm as that named by the man in Chicago. The Electric Machine Corp., manufacturers of the Elmco Universal test stand, states that it knows nothing about J. C. Engle and has never had any one in its employ answering the description of this man, who is said to be about 35 years old, rather tall, weighing about 175 lbs. and of medium complexion.

Pierce-Arrow--Lafayette Merger Under Way

Details of Plan for Union Being Worked Out Swiftly

NEW YORK, April 29—Details of the plan for a merger of the Pierce-Arrow Motor Car Co. and the Lafayette Motors Co. are being worked out as rapidly as possible and probably will be submitted to stockholders in a short time. The consolidated company, in addition to an exchange of stock, is expected to issue $10,000,000 or $12,000,000 worth of notes and bonds. The proceeds will be used to pay off bank loans of Pierce-Arrow which approximate $8,000,000, as well as the bank loans of the Lafayette company and provide working capital.

The capitalization of Pierce-Arrow consists of $10,000,000 in 8 per cent preferred stock and 250,000 shares of no par value common. It has no funded debt.

The Lafayette company has outstanding $4,000,000, 7 per cent preferred and 40,000 shares of no par value common. It also has no funded debt.

TIRE MEN OPTIMISTIC

Akron, April 28—Seven hundred field men, sales representatives and branch managers of the Firestone Tire & Rubber Co., from as many cities in the United States and Canada and from the principal tire distributing centers of Cuba and Mexico, united at their annual conference here in sending broadcast a message of cheer and optimism with the declaration that business everywhere is showing substantial signs of complete recovery.

At the opening session of the three-day conference, General Sales Manager L. G. Fairbanks announced that Firestone was near its peak production with a daily output at present of nearly 24,000 tires and 25,000 tubes, as compared to a peak in 1920 of 28,500 tires a day.

619 PACKARD 10-YEAR MEN

Detroit, April 29—One hundred and nineteen employes of the Packard Motor Car Co. this week received gold watches from the management in observance of their completion of 10 years' service with the company. The addition of this class brings the Packard "decade or more" men to 619 or 11 per cent of the total factory enrollment. Alvan Macauley, president, presented the watches assisted by E. F. Roberts, vice-president in charge of manufacturing, and F. R. Robinson, secretary-treasurer.

RELIANCE BECOMES BANKRUPT

Milwaukee, Wis., May 1—The Reliance Motor Truck Co., of Appleton, Wis., manufacturing the Reliance truck and truck axles, has gone into voluntary bankruptcy with liabilities scheduled at $261,977 and assets of $187,988.

Large Gain In Production In the Milwaukee District

Some Plants 100 to 250 Per Cent Ahead of Output for a Year Ago

MILWAUKEE, Wis., May 1—Automotive parts industries here have just concluded one of the best months in their respective existences in volume of products manufactured and delivered. April was so far ahead of the same month last year that there is hardly any basis of comparison. Compared with April in 1920, gains ranging anywhere from 25 to 100 per cent are reported, with some concerns as much as 250 per cent ahead. In only a few instances, however, has the record of the corresponding month in 1919 been surpassed. Prospects for May are said to be even better, for the sharp revival in the demand for passenger cars in the last 60 to 90 days is being felt as well in motor trucks, and the tractor trade is believed to be at the end of its hibernating period.

For the first time in more than two years Milwaukee foundries are advertising for help. This refers to skilled labor, common workmen being plentiful. It is true, of course, that there are a good many skilled men who are not inclined to take jobs because they are dissatisfied with the wage scale offered by employers, and this may account in part for the apparent shortage which makes it necessary to advertise for help. Malleable shops are ahead of steel and gray iron foundries in respect to degree of renewed activity, but the latter are coming forward steadily under the stimulus of demand for automotive parts.

The four-cylinder division of Nash Motors Co. at Milwaukee, which has been operating six 10-hour days a week for a month or two past, is now putting on three hours overtime three days a week, or 69 hours a week. It is understood that straight time is paid for overtime, instead of the time and one-half rate once in effect.

The Stoughton Wagon Co., which is now devoting practically its entire effort to building motor trucks, experienced the largest April business in its 64 years of existence and the past month probably ranks higher than any other single month in that time, due to the market revival in truck sales. Motor bus sales are mounting into relatively enormous figures.

The Oneida Motor Truck Co at Green Bay, Wis., has resumed the operation of its large factory, and the Winther Motors, Inc., Kenosha, is greatly enlarging its production, especially due to a $2,000,000 contract for 1000 taxicabs for Chicago.

Mitchell at Racine; Kissel at Hartford; Case at Racine, and numerous other passenger car factories in Wisconsin have made further increases in daily output in the last 15 days, supplementing gains in working hours and number of workers effected during the last 60 days. Nash at Kenosha and Milwaukee as well as on the heaviest schedule in a year or longer.

Manufacturers of automotive equipment, both for car and truck builders as well as for the jobbing and retail trade, are becoming crowded with orders, heavy pressure having been felt especially in the last two weeks. Delivery specifications for May so far received indicate even heavier pressure.

New "Mottoes for Motorists" By N. A. C. C.

NEW YORK, May 1—The National Automobile Chamber of Commerce is responsible for the following mottoes for motorists:

Still motors run sweet.
Home is where the car is.
A soft tire turneth away cash.
While there's gas there's hope.
Fools pass on hills and curves.
A wise driver maketh a glad auto.
It is better to be slow than sorry.
Declines make the wheels go faster.
Dry springs squeak louder than "birds."
To speed is human; to get caught is fine.
As the wheel is bent so the car will go.
Where there's a nail there's a puncture.
A body's as old as its paint; a motor's as old as it pulls.
Spin and the world spins with you; stall and you stall alone.

"Caravan" to Show Congressmen Need of Roads

Washington, April 28—Co-operating with the National Automobile Chamber of Commerce, the Colorado to Gulf Highway Assn. has arranged for a caravan of senators and congressmen to go to the Shriner's convention in San Francisco next June.

Twelve cars of delegates are to leave the White House next Monday at noon, under the pilotship of Capt. Bernard McMahan, of the Colorado to Gulf Highway Assn. The needs of good roads and better highways, it is declared, will be forcibly called to the attention of the party, especially in the west where it is stated that they are badly needed.

The route of the Caravan will be via Richmond, Atlanta, Birmingham, Memphis, Little Rock, Dallas, through west Texas to Raton, N. M., where the caravan will be augmented by 80 or 90 cars for the last lap of the trip which will get the party to San Francisco about June 12.

SAXON PLANT MOVED

Detroit, April 29—The Saxon Motor Car Corp., has moved its entire plant and executive offices from Detroit to Ypsilanti, Mich.

Chevrolet Flat Rate System Ready; Will Be Issued Soon

Dealers and Depots Everywhere to Have Company's Plan of Charging for Maintenance

DETROIT, April 27—Chevrolet Motor Co. will issue soon after May 1, 15,000 copies of its flat service rate plan to its branches, dealer organization and independent parts depots. Details of the plan, which fixes a fair price on every major operation and most minor operations on both models of Chevrolet cars, have been carefully worked out and dealers will be expected to adhere closely to the plan.

In issuing the plan the company will not take an arbitrary stand in its enforcement, but will leave it to the dealer's initiative to recognize it as a definite step forward in promoting the interest of the company, the dealer and of Chevrolet owners. Developments in the industry have impressed themselves on factory executives as demanding a basis upon which cost of servicing may be predetermined.

There are from 15 to 18 major operations on the car which are given numbers under the plan, and a large number of minor operations which are lettered. Where major and minor operations combine these are set forth with the average time required for the work and the cost. Prices on genuine parts which may be installed are to be added to the cost of operations giving the final costs.

Major operations are considered as those which require the removal of a major part and minor operations, those which are readily accessible. Minor operations which can only be performed by the removal of major parts assume the costs of both. In all cases the varying conditions which may be met in performing the work have been considered in fixing the time charge.

In a prelude to the plan, it is set forth that the varying times fixed take into consideration the use of tools of certain general types which dealers will be expected to have included in their shop equipment. Where dealers expect to base their charges as outlined in the plan it will be necessary for them to have similar tools. These are all described and priced for dealers in the Chevrolet tool list, and are also listed in the tool albums carried by the Chevrolet road men.

With the promulgation of the fixed rate service plan Chevrolet is building up through its dealer organizations a system of parts depots in independent garages located in strategic points throughout the country. These parts depots will be authorized through the dealer as Chevrolet parts depots and will carry supplies of parts bought through the dealers at a fixed discount.

Who's Who in "One of a Thousand"

Partial List of Automobile Dealers Who Have Been Elected to Membership In the N. A. D. A. Under New Selective Plan

ST. LOUIS, May 1—Following is a partial list of the automobile dealers elected to membership in the National Automobile Dealers Assn., under the "One of a Thousand" plan recently adopted by the association. Other names will be published later.

Arkansas

Blocker & Bourland, Fort Smith.
DeJarnette Motor Co., Fort Smith.
Loden Motor Co., Fort Smith.
Sheridan, Paul W., Fort Smith.
Thomas Auto Co., Little Rock.

California

William L. Hughson Co., San Francisco.
Lynn C. Buxton, Los Angeles.
Greer-Robbins Co., Los Angeles.
Dandy Motor Co., Fresno.

Colorado

Tom Botterill, Inc., Denver.
R. R. Hall Cadillac Co., Denver.
Mountain Motors Co., Denver.
S. B. I. Motor Sales Co., Denver.
MacFarland Auto Co., Denver.
Craig-Baker Co., Denver.
Barnett, W. W., Denver.

District of Columbia

Semmes Motor Co., Washington.

Florida

L. A. Jones, Miami.

Georgia

Martin Nash Motor Co., Atlanta.

Illinois

Soenksen, James C., Aurora.

Indiana

Lathrop-McFarland Co., Indianapolis.
R. V. Law Motor Co., Indinapolis.
Losey-Nash Motor Co., Indianapolis.
Sanders-Haynes Motor Co., Indianapolis.
Wildhack Co., The, Indianapolis.
Fifth Avenue Garage, Gary.
Huff-Buick Co., Indianapolis.
Wallerich, C. H., Indianapolis.
Bethard Auto Co., Richmond.

Iowa

Rude Auto Co., Cedar Rapids.
Central Iowa Motors Co., Des Moines.
Clemens Auto Co., Des Moines.
Gohring Auto Co., Iowa Falls.
Hudson-Jones Auto Co., Des Moines.
Des Moines Buick Auto Co., Des Moines.
Ideal Auto Co., Des Moines.
Krudenier Cadillac Co., Des Moines.
Laster-Reo Co., Des Moines.
Payne Motor Co., Des Moines.
Sears Auto Co., Des Moines.
Morris Motor Co., Waterloo.
Harter B. Hull, Waterloo.
Gidley Auto Co., Shenandoah.

Kentucky

Embry-Weir Co., Louisville.
Overland-Louisville Co., Louisville.
Roy E. Warner Co., Louisville.

Louisiana

Abbot Automobile Co. Inc., New Orleans.
Gus D. Revol, New Orleans.

Massachusetts

New England Velie Co., Boston.
Smith Motor Car Co., Haverhill.

Michigan

Simons Sales Co., Detroit.
Marshall Automobile Co., Flint.
Garber Buick Co., Saginaw.
Hubbell Auto Sales Co., Saginaw.
Sutton Sales Co., Saginaw.
Saginaw Cadillac Co., Saginaw.

Minnesota

Cargill-Guibord Motor Co., Duluth.
Foster Motor Co., Duluth.
R. & R. Garage, Duluth.
Northern Motor Co., Duluth.
Interstate Auto Co., Duluth.
Knudsen Auto Co., Duluth.
Mutual Auto Co., Duluth.
Russell S. Sherman, Duluth.
Furland Auto Co., Duluth.
L. McNamara, Duluth.
Johnson & Morgan, East Grand Forks.
Fawkes Auto Co., Minneapolis.
Harrington Motor Co., Minneapolis.
Northwestern Oldsmobile Co., Minneapolis.
Northwestern Auto Co., Minneapolis.
Payne Motor Co., of Minn., Minneapolis.
Twin City Motor Car Co., Minneapolis.
Bingham & Norton Co., St. Paul.
Einar Leo Motor Co., St. Paul.
L. W. Jordan Co., St. Paul.
Roller Motor Co., St. Paul.

Missouri

Fred A Groves Motor Co., Cape Girardeau.
Century Auto Company, Joplin.
Davis-Cadillac Co., Joplin.
Greenlease Motor Car Co., Kansas City.
Hudson-Brace Motor Co., Kansas City.
Butler Motor Co., Kansas City.
Elwood Motors, Kansas City.
De Luxe Auto Co., St. Louis.
Hudson-Frampton Motor Co., St. Louis.
Johnson Auto Company, St. Louis.
More Automobile Co., St. Louis.
Mississippi Valley Motor Co., St. Louis.
Cadillac Automobile Co. of St. Louis.
Mound City Auto Co., St. Louis.
Southwest Nash Motor Co., St. Louis.
Tate Motor Co., Inc., St. Louis.
Vesper-Buick Auto Co., St. Louis.
Cowden-Buick Co., Springfield.
Weber Implement & Auto Co., St. Louis.

Montana

T. C. Power Motor Car Co., Helena.

Nebraska

Albert E. Stitt Motor Co., Hastings.

New Jersey

Bonnell Motor Co., Newark.
Bergen Auto Company, Rutherford.
Green Motor Car Co., Newark.
Hudson County Buick Co., Jersey City.
Detroit Cadillac Motor Co., Newark.
Franklin Motor Car Co., Newark.
Donald McGregor Sales Co., Newark.
W. C. D. Motor Car Co., Newark.
E. A. Browne Auto Co., Patterson.
Stein-Heimlich Auto Co., Long Branch.

New Mexico

Pioneer Auto Co., Clayton.

New York

Van Cortland Vehicle Corp., New York.
Elsey Motor Co., New York.
Mohawk Valley Motors Inc., Utica.
B. C. Dickover Co., Pleasantville.
Detroit Cadillac Motor Corp., New York.
Jos. F. Haas, Motors, Inc., Brooklyn.
L. A. D. Motor Corp., Brooklyn.
Syracuse Motor Co., Inc., Syracuse.
Monroe Motor Car Co., Buffalo.
Wm. J. Clapper & Son, Wolcott.

North Carolina

C. C. Coddington, Inc., Charlotte.

Ohio

H. & T. Auto Co., Cincinnati.
Franklin-Cincinnati Co., Cincinnati.
Herold Motor Car Co., Cincinnati.
Cincinnati-Oakland Motor Co., Cincinnati.
Citizens Motor Car Co., Cincinnati.
Nash-Cincinnati Motors, Cincinnati.
Schiear Motor Car Co., Cincinnati.
Close Motor Sales Co., Toledo.
Lamdman-Griffith Co., Toledo.
Davis Motor Sales Co., Toledo.
Doan Motor Car Co., Toledo.
Leonhardt-Geller M. S. & S. Co., Toledo.
Sturtevant-Jones Co., Toledo.
Willys-Overland, Inc., Toledo.
Ortman Motors Co., Washington, C. H.
Elton Motors Co., Youngstown.
Beecher P. Highby, Youngstown.
Frank B. Smith Garage, Youngstown.
Van Baalen Auto Co., Youngstown.
Wick Ave., Motor Co., Youngstown.
Ohio-Buick Company, Cleveland.

Pennsylvania

General Motors Truck Co., Pittsburgh.
Keystone Buick Co., Pittsburgh.
Overland-Harrisburg Co., Harrisburg.
Louis C. Bleck, Inc., Philadelphia.
Gomery-Schwartz Motor Car Co., Philadelphia.
Neel-Cadillac Co., Philadelphia.
Philadelphia-Nash Motor Co., Philadelphia.
Wills-St. Claire Co., of Pa., Philadelphia.
Smith-Foster Motor Car Co., Sharon.
John Burton Arbuckle, Erie.
Sergeant, Freeman, Acker Co., Erie.
Stirling Bros. Co., Erie.
Whitehill-Gleason Motors, Inc., Pittsburgh.

South Dakota

W. C. Misson, Aberdeen.
American Motor Sales Co., Sioux Falls.
John P. Bleeg Co., Sioux Falls.
Clements Auto Co., Sioux Falls.
Hahn Motor Co., Sioux Falls.
Knapp Brown Co., Sioux Falls.
Northwestern Motor Co., Sioux Falls.
Stephens-Overland Co., Sioux Falls.
Wilson-Barber Auto Co., Sioux Falls.

Texas

William Morriss, Dallas.
A. H. Ross & Son, Gainesville.
Carter Auto Co., Galveston.
R. P. Amacher, San Angelo.
Herrick Buick Co., Waco.
Central Motor Co., Waco.
George K. Marshall, Inc., Galveston.

Utah

Alkire-Smith Auto Co., Salt Lake.
Botterill Auto Co., Salt Lake.
Randall-Dodd Auto Co., Salt Lake.
Ogden Motor Car Co., Ogden.

Washington

Lind Garage, Lind.
Bell-Wyman Co., Yakima.
Burrows Motor Co., Yakima.
Andrews Motor Co., Yakima.
Eldridge-Buick Co., Yakima.

West Virginia

Midelburg Garage, Charleston.
Ransome Motor Car Co., Clarksburg.

Wisconsin

Jesse A. Smith Co., Milwaukee.

Wyoming

William E. Dineen, Cheyenne.

BUSINESS NOTES

Tennant Bros., automobile bankers, Chicago, report a better class of people buying automobiles this year. There is nothing indefinite about "deals" any more, according to a member of the firm and the general feeling of the buyers seems to indicate that they are sure prices have stabilized, at least as far as decreases are concerned. Many are buying now believing that prices will go up in a short while.

Beacon Tire Corp., Chicago, has changed its name to Sullivan Pliska Motor Corp.

Six Wheel Truck Co., will relocate at Waupun, Wis.

Sizer Forge Co., Buffalo, will take over the management of the Hammond Steel Co., Syracuse.

Victor Rubber Co., Springfield, Ohio, is now working five days a week

Harley Co., Springfield, Mass., will not, it is thought, have to go into the hands of a receiver, due to the fact that a big order for drop forgings has been received from an automobile manufacturer in Cleveland.

V. C. Cochrane and **L. G. Bartz**, of Spokane, have installed the Sandpoint Tire & Battery shop at Sandpoint, Idaho.

Webster Advertising Club, Buffalo, hold used car auctions here weekly at which dealers may sell their cars.

J. H. Jansen Cadillac Co., Omaha, Nebr., gave a banquet recently at which all of the members of the sales force were present.

Wayne Tank & Pump Co., Fort Wayne, Ind., is the new name of the Wayne Oil Tank & Pump Co.

Republic Rubber Corp., Youngstown, Ohio, is operating at a profit for the first time in several years.

Hinckley-Myers Co. has opened Detroit offices in the General Motors Building.

Beckley-Ralston Co., in their May catalogue, have one page devoted to radio.

Sprague Tire & Rubber Co., Omaha, Nebr., has doubled its output of tires in the past month.

American-La France Fire Engine Co. and **S. F. Hayward & Co.** have moved into new offices in New York.

Springfield Durant Co. heads recently conferred with W. C. Durant on the erection of a large distributing branch here to serve the New England states.

Stewart Speedometer directors have increased the quarterly dividend from 50 cents to 75 cents per share.

R. J. Kilkelly and **Robert Emmond**, state managers in Iowa and Illinois for the Day and Night Auto Service Corp., St. Paul, Minn., have opened offices in Davenport, Iowa. Six states are at present in the field and organization in others is going ahead rapidly, according to the local managers.

Alva Kane and **George L. Irwin** have opened the Majestic garage here with capacity for storage of 300 cars. C. P. Spencer will head the maintenance division force and all-night service will be provided. The P. M. Lattner Sales Co., Marmon representatives, has taken a salesroom in the building.

Thexton Machine Co., manufacturers of piston rings, have taken a five-year lease on 5,000 feet at Montreal.

Day & Night Garage at Omaha, Nebr., burned recently, including 12 automobiles with an estimated loss of $10,000.

Cutting Equipment Corp. has been formed at Buffalo with a capital of $500,000 to manufacture automobiles and other motor vehicles. The incorporators are John E. Fagan, Charles H. Kerr and others of Buffalo.

Chassis Lubricating Corp., which has been conducting experiments for three years on a chassis lubrication system, has located its factory at Monroe, Mich., and has an assembling plant at New York. The company is incorporated in Delaware for $1,200,000 and the officers are Rex W. Wadman, president; Fred H. Gleason, chief-engineer, and Martin W. McCloskey, secretary and treasurer. The directors are Fred H. Gleason, Joseph Van Blerck, E. V. Rippingille, George V. Codrington and N. G. Rost. Van Blerck is the head of a factory producing marine, aerial and truck engines and Rippingille is president of the Watson Stabilizer Co., and was, until recently, assistant sales manager of the Hudson Motor Car Co. The chassis lubricator will be furnished to car and truck manufacturers to be built into chassis as standard equipment.

Griffith-Hope Co., Milwaukee, is the style of a new $20,000 corporation organized to manufacture a line of automotive and electrical specialties. The principals are Samuel N. Hope, who has been assistant manager of the Briggs & Stratton Co., and Ray W. Griffith, who has been general superintendent of the same company for several years. Raymond T. Zillmer is attorney. The new concern has leased manufacturing space and will be in production at once.

Cities Service Oil Co. has succeeded the Bartles Oil Co., St. Paul, and the Cedar Rapids Oil Co., Cedar Rapids, Iowa. The company produces, refines and markets petroleum products, and has offices and warehouses also in Ashland, Wis., Sioux City, Des Moines, Fort Dodge and Davenport, Iowa, Grand Forks, N. D., and Mankato, Minn.

Obenberger Forge Co., West Allis, Milwaukee county, has been incorporated with a capital stock of $250,000 by the secured creditors of the defunct John Obenberger Forge Co., of Milwaukee.

Great Northern Railway, Omaha, Nebr., beginning May 1, will inaugurate the use of motor busses between Grand Forks and Crookston and Fargo and Crookston, N. D., due to the extensive travel that is now carried by automobile lines, according to bulletins received in Omaha and Sioux City.

K. O. Muehlberg Mfg. Co., a $75,000 corporation organized at Manitowoc, Wis., to build automotive shop tools, has found it unnecessary to erect its proposed new machine shop, since it has been able to purchase a modern factory building with about 20,000 sq. ft. from a concern which is moving its operation to Chicago. Possession will be given May 1. K. O. Muehlberg, president of the company, conducted a small shop for many years, developing the present line of Muehlberg automotive specialties within the last three years. Orders on the books will require the full capacity of the new quarters past the summer.

Louis Renault Automobile Co., Paris, France, has been transformed into a joint stock corporation to be known as the **Societe Anonyme des Usines Renault** with a capital of 80 million francs.

BOSCH HAS SERVICE PLAN

Springfield, Mass., April 29—The American Bosch Magneto Corp., announces a plan to take care of such service as the company believes is due the purchaser of Bosch equipment. The plan is as follows:

When any vehicle equipped with Bosch electrical apparatus is sold, the dealer fills out a post card supplied him for that purpose and mails it to the manufacturer. This card gives the name and address of the purchaser and a description of the vehicle. The Bosch corporation then supplies the purchaser with an identification card which entitled him to free service at any Bosch maintenance station during the guarantee period. The purchaser is also supplied with addresses of the Bosch representatives. There are more than 500 Bosch maintenance stations at which these cards will be recognized.

STUDY FOREIGN TIRE MARKET

Washington, April 29—A survey of the European automobile tire market will be made by the Department of Commerce, it was announced by the Rubber Division, following a conference of national tire builders and rubber dealers.

"Ask 'Em to Buy" Boon to Missouri Dealer on Rainy Day

"Cashes In" on Telephone When Weather Prevents Owners From Driving; Hint for Others

CHICAGO, April 29—An unusual instance of the business-getting power of "Ask 'Em to Buy" was related by a salesman for the Faeth Company of Kansas City, in a letter forwarded to the Automotive Equipment Assn. here. The salesman tells about it as follows:

"I called on a customer of mine at Londo, Mo., last Monday, the day it rained continually. Everyone else along the route had been 'feeling pretty bad—no work,' so when I walked in I said: 'Don't you start singing the blues to me or—.' 'Not me,' he said. 'Look at my shop.' It was full. 'I have enough work to keep everyone busy if it rains for three days. Let'er rain.'

"'Where did you get it?' I asked.

"He replied: 'When I opened the garage this morning, I saw what kind of a day it was going to be and remembering the 'Ask 'Em to Buy' I got busy on the telephone. 'What about fixing that car while you can't use it?' I asked.' 'It's too muddy,' they would reply. 'I can't get it to the garage.' 'Never mind, I'll send a mechanic down after it,' I would answer. As a result, look at my shop.'"

INCREASE IN TIRES AND TUBES

New York, April 18—Statistics of the rubber industry for the first two months of the year as compared with the same period in 1921 show a very material increase in production of pneumatic casings, inner tubes and tires. Notwithstanding this fact inventories for both months were considerably less except in the case of inner tubes which show stocks on hand at the end of February larger than at the close of either January or February, 1921. Shipments were materially larger but the gain was not so great in comparison with last year as in the production field. Tire production for the first two months of the year was running at the rate of more than 24,000,000 per annum.

MAKING BANDIT-PROOF CARS

Lansing, April 10—The Reo Motor Car Co. has delivered to the Adams Express Co. 14 chrome steel lined cars for its bandit-proof New York **delivery** service. These cars are the first of an order for 100. The enclosed body has specially closed windows and a windshield which is proof against .45-caliber steel jacketed bullets.

REACHES GREATEST PRODUCTION

Indianapolis, April 29—The Oakes Co., manufacturers of automobile parts, states that it is now producing a greater quantity than at any time in its history, and is operating a night shift.

IN THE RETAIL FIELD

Franklin Service & Sales Co., has been organized in Waterloo, Iowa, by L. E. Conry and Roy Buxton, who have purchased the Cramer Motor Car Co. business. They will continue the Franklin car agency.

Mitchell Motors Co., Inc., Racine, Wis., announce the appointment of three new distributing organiaztions and a considerable number of new dealers for Mitchell F-50 cars. The distributors are as follows: Tampa Bay Motor Co., Tampa, Fla.; Watson Automobile Co., Sioux City, Iowa; McNulty & Dafoe Co., Inc., Minneapolis, Minn.

J. N. Johnson Co. has planned out a campaign of several weeks to put a new tire on the market in this territory. The company will retain the Goodyear distribution, but has added a state agency for the Kenyon tire.

Owen Motor Sales Co., St. Paul, is compelled by growing business to build for the third time. It has just completed a wing to its main building and in the fall will add a story covering the whole structure. Day and night Ford sales and service is conducted here. Sixty-five employes are now required, 34 being mechanics, three painters, two radiator men, a battery, nine salesmen and six clerks, beside the officials. The salesroom is the largest in the city.

Jack Fuller, Hupmobile distributor, says the business of the Fuller Automobile Co. for the first three months of this year was nearly double that of last year.

A. H. Alexander, Webster City, Iowa, has secured the state distribution of the American Steamer, a new steam car being placed on the market by the American Steam Truck Co., Chicago.

Power Equipment Co., Minneapolis, has become distributing agency for the Spreckels Savage tire, and will place sales offices throughout Minnesota, the Dakotas, northern Wisconsin and Michigan.

Grant Motors, Inc., Philadelphia, whose temporary offices were destroyed by fire last week, have arranged to move into their new building, where it will have its own sales facilities with much larger scope.

Ward & Haskell, North Tonawanda, N. Y., automobile dealers, will in the near future break ground for a large new sales and service building.

Pacific Motors Co. has been incorporated in Portland, Or., to handle the Durant car throughout Portland and vicinity. Arrangements for the franchise were completed this week on the occasion of a visit from C. M. Steves, of San Francisco, salesmanager for the Durant interests on the Pacific coast.

Studebaker Sales Co., Philadelphia, has opened a new maintenance station, parts department and new car delivery department. There are shower baths for the mechanics and numerous improved features. There is 35,000 square feet of floor space.

J. I. Case T. M. Co., Racine, Wis., manufacturer of the Case car, has purchased the sales and service building of the defunct Jack Evans Auto Sales Co., Racine, and leased it to Harry J. Herzog who has been appointed local dealer of the Case.

Harry Raper, Roman Hammes and Fred Scheppe, associated with the Ford in LaCrosse, Wis., for several years, have resigned to form a partnership which will distribute the Durant in LaCrosse, Vernon and Monroe counties, with headquarters in LaCrosse.

Topp Oil & Supply Co., Milwaukee, recently incorporated for $75,000, has opened its permanent store, offices and warehouse. The tank storage and general warehousing plant is in Waumatosa, a suburb. Harry C. Topp, for many years treasurer of the O'Neil Oil & Paint Co., is president and general manager of the company.

W. J. McGinnis, Green Bay, Wis., will build a $50,000 public garage, sales and service building, two stories and basement, to be ready about July 1.

Peterson Bros., Sturgeon Bay, Wis., are building a one-story fireproof garage, 50x85 ft., and will specialize in general automotive maintenance, having no present intention of engaging in business as dealers. They will, however, deal in automotive equipment of all kinds.

Valley Auto Supply Co., Neenah, Wis., recently organized by Leo Promen, is opening for business.

Ehrlich & Kindel Vulcanizing Co., Sheboygan, Wis., has purchased a building and will convert it into a store, shop, warehouse and maintenance station.

Hugo Brueckner, Beaver Dam, Wis., has engaged architects to design a new one-story fireproof garage and repairshop, 46x122 ft.

Charles W. Hale, Shreveport, La., formerly of Neenah, Wis., has leased a building and will remodel it into a public garage and maintenance station, to be ready about May 1.

Guy S. Pelton has been elected president of the W. Frank Horn Co., Inc., Milwaukee, to succeed W. Frank Horn. The Horn company is distributor in Wisconsin of the Bosch and Gray & Davis electrical devices, Stromberg carburetors, Hayes wheels, Hartford shock absorbers, Diamond springs and Peerless piston rings.

Auto Tire Repair Co., Chippewa Falls, Wis., has moved into new and larger quarters. It has recently been appointed representative of the United States tires.

Schmidt Motor Co., Milwaukee distributor of the Sayers Six and Clydesdale trucks, has moved into new quarters.

Math. Kirar, Kenosha, Wis., has been appointed exclusive local representative of Johnstone tires, made in LaPorte, Ind.

Alma & Nelson Auto Co. has been organized by Matson Walker of Nelson, Wis., and Martin Hanson, of Alma, Wis., to handle the Ford representation in Nelson and Alma.

Loomis-Weinke Motor Co., Portage, Wis., has plans for a $15,000 garage and maintenance station addition.

G. A. Dollert, LaCrosse, Wis., will build a public garage and maintenance building, 40x77 ft., with a wing, 20x50 ft., at a cost of $20,000. Architects Parkinson & Dockendorff are preparing plans.

Garage & Accessory Shop, West Allis, Milwaukee, Wis., has been acquired by Herbert Swantz, of Union Grove, Wis., who has changed the name to The Fair Garage. It is opposite Wisconsin State Fair Park.

Safety Traffic Light Mfg. Co., Milwaukee, is a new corporation organized with a capital stock of $100,000 to engage in the manufacture of an automatic traffic regulating device which has undergone exhaustive experiments on several of the principal arterial highway intersections in Milwaukee for several months. The project is backed by Walter W. Lange, a wealthy foundry owner of Milwaukee, who is associated with T. S. Lawrie, the inventor, and John C. Warner, in the enterprise.

Stover Signal Engineering Co., Cleveland, Ohio, manufacturing the Arrowlite signal for motor vehicles and other signal devices, has moved its plant and offices to Racine, Wis., to take advantage of the excellent sources of supply of raw, semi-finished and finished materials.

K. O. Muehlberg Co., Manitowoc, Wis., manufacturer of a new type of automatic drill and other advanced mechanical devices for automotive, gas engine and service shops, has obviated the need of building a new machine shop by acquiring the Hoffman Glove Co.'s large factory for $35,000.

Anton E. Reif & Co., Manitowoc, Wis., have opened a tire store and will feature the Hydro-Toron line of fabric and the General cord tires.

Olson & Pauly Co., Milwaukee, distributor of the Holmes, has been appointed representative of the Winton Six.

Elmer Smith Auto Co., Fond du Lac, Wis., has been incorporated with a capital stock of $15,000 to manufacture automotive equipment, deal in new and used cars, etc. The incorporators are Lee Medberry, Rose Smith and Elmer Smith, who is manufacturing a timer for Fords and other ignition specialties of his own design.

Max Goeman, Antigo, Wis., proprietor of a garage, has filed a voluntary petition in bankruptcy, scheduling liabilities at $19,161, and assets at $6,347.

Louis Odry, Cudahy, Wis., will build a public garage and maintenance station, 58x120 feet, at an estimated cost of $22,000.

Tomah Iron Works & Garage, Inc., Tomah, Wis., a new $30,000 corporation, takes over and merges the business of the Janke Garage Co. and the Tomah Iron Works, which conducted a motor service department several years. Officers of the new company are: President, R. S. Murray; vice-president, C. A. Murray; secretary, Carl A. Sweet; treasurer, H. M. Warren; director, W. W. Warren.

Truck Tire Service Co., Milwaukee, has been formed by Edward Levinson, who recently was appointed distributor of the truck tire department of the B. F. Goodrich Rubber Co., Akron, Ohio.

Kelly-Springfield Tire Co. Discontinuing Its Branches

Warehouses Near Railroad Centers to Be Established Soon

NEW YORK, April 15—Consolidation of the general offices of the Kelly-Springfield Tire Co. at 250 West 57th st. this city, was designed to organize more efficiently the executive branch of its business. A significant feature of the reorganization is that the New York branch has been moved to the company's warehouse at 553 West 57th Street, a step which is really equivalent to giving up the branch altogether since it now has no display rooms or sales counters.

The company explains its action on the ground that with the stabilization of the industry there is no need for the maintenance of these expensive establishments. With the discontinuance of all retail sales by the company the factory branch was deemed a needless expense. This overhead burden will be eliminated in all cities as soon as practicable and warehouses will be established in various centers of distribution where railroad facilities are best suited to give prompt service to dealers. In all these cities the branches will be supplanted by offices, which in many cases will be in the warehouses.

GEAR MANUFACTURERS MEET

Buffalo, April 29—Gear manufacturers from all over the United States were in Buffalo for the sixth annual meeting of the American Gear Manufacturers' Assn. last week.

J. B. Foote and C. F. Godke of Chicago, E. J. Frost of Jackson, Mich., and W. H. Phillips of Pittsburgh were elected directors of the association. These men will be members of the association's executive committee for the next four years.

F. N. Sinram of Cleveland was chosen president for his seventh consecutive term; Ray Johnson of Muncie, Ind., and B. F. Waterman of Providence, R. I., were named vice-presidents, and F. D. Hamlin of Philadelphia was re-elected secretary-treasurer.

J. B. CURTIS DIES SUDDENLY

Indianapolis, April 27—James B. Curtis, of New York, 61 years old, a director and general counsel of the National Motor Car & Vehicle Corp., was found dead in his room in a hotel here today, apparently as a result of an attack of heart disease suffered during the night. He had come here to attend the quarterly meeting of the directors of the National Company.

SEIBERLING TIRES REDUCED

Akron, O., April 28—The Seiberling Rubber Co. has announced a reduction approximating 10 per cent straight through the line on Portage fabric tires.

CONCERNING MEN YOU KNOW

Harry J. Schwartz, aged 37, president and general manager of the Standard Motor Car Co., central Ohio distributor for the Hudson and Essex, died suddenly April 21 of embolism, following an operation for removal of tonsils.

C. M. Hall, formerly in charge of the New York territory for the Dodge Transmission Co., has become associated with the Black & Decker Mfg. Co., and will have the territory including Indiana, Kentucky, and the corner of Ohio which includes Cincinnati and Dayton.

D. C. Barnett, Indianapolis, who succeeds Lynn M. Shaw as secretary of the Youngstown Automobile Dealers' Assn., has taken Shaw's place as manager of the Indiana Automotive Trade Assn. Shaw has assumed his position as assistant general manager of the National Automobile Dealers' Assn., and has started on a trip which will cover 14 cities in Texas, the Gulf states and the Atlantic coast states.

Louis A. Staff, who recently retired from Staff Brothers Co., New York, will continue for himself in the business of handling automotive equipment. He has opened offices in New York.

L. F. Acker has been appointed manager of the new Detroit branch office of the Simms Magneto Co., where the company will also maintain a show room. Michigan and Ohio will be covered from this office.

H. J. Lount has been appointed comptroller of the Cadillac Motor Co. He is succeeded in his former position as head of the factory accounting department by L. S. Carter.

Frank B. Wolfe, assistant comptroller of the General Motors Corp., in charge of the cost division, has resigned to enter private accounting work in Detroit.

Malcolm Grant, whose former experience has been largely in efficiency and time study work in automotive factories, has joined the Black & Decker organization in a selling capacity.

Clarke D. Hunter has been appointed salesmanager for the S. R. Blockson Motor Co., Stutz distributor, Philadelphia. He has been with the Blockson organization for the last four years.

Walter H. Alford, vice-president of the Nash Motors Co., Kenosha, Wis., was elected a member of the Kenosha city council for a two-year term under the new city manager form of municipal government thereby ratified and confirmed at the spring election.

Edward J. Butler, formerly with the Overland Wisconsin Co., Milwaukee, has been appointed manager of the exchange car department of the Milwaukee branch of the Packard Motor Car Co.

John B. Hurst has resigned as manager of retail sales for Herbert Bros., Chandler cars, Philadelphia, and has been appointed Chandler-Cleveland representative for Berks county and the city of Reading.

Ed Yount, Cedar Rapids, Iowa, has been appointed district representative for the Gill Piston Ring Co., Chicago. Yount was branch manager for the Goodrich Rubber Co. here two years.

C. A. Swinehart, former salesmanager of the Victor Rubber Co., Springfield, Ohio, has accepted the position of salesmanager with the Hannibal Rubber Co., Hannibal, Mo. Swinehart was for eight years connected with the Victor company, following which he was with the Swinehart Tire and Rubber Co. as salesmanager.

Frank E. Smith, president of the Republic Motor Truck Co., has been added to the membership committee of the motor truck committee of the National Automobile Chamber of Commerce.

A. B. Waugh, commissioner of the Omaha Auto Trade Assn., was elected manager of the Omaha Auto club last week. Waugh will continue to serve as commissioner of the association.

C. B. Lynn, for the past two years assistant manager of the Portland, Ore., branch of the White Co., has been promoted to manager and C. W. Cornell, manager, has been appointed manager of the Seattle branch of the company, it was announced last week on the occasion of a visit in Portland of G. A. Urquhart, of San Francisco, Pacific coast manager for the White company.

Stanley Gricht has joined the staff of Mathias & Heintz, distributors of Selden trucks.

E. Phil Merrill, of the sales department of C. H. Wills & Co., Marysville, Mich., had a signal honor conferred upon him by Yale University recently when he was invited to deliver a lecture on the salient features of the Wills-Sainte Clair car before the students of the Yale-Sheffield Scientific School at New Haven, Conn.

C. W. Sieberling, Jr., son of the former president of the Goodyear Tire & Rubber Co., will distribute Wills-Sainte Claire cars in New Mexico.

W. E. Arnold, formerly of Indianapolis, has been appointed salesmanager of the National Motor Sales Co., Chicago distributor of the National. He succeeds Fred Wellman who has entered the automobile accessory business.

Goverment vs. Lincoln Co. Without "Fear or Favor"

Washington, April 28—Prosecution of the Lincoln Motors Co. case will be without "fear or favor," Attorney General Daugherty declared. He announced that Assistant Attorney General Riter had been ordered to Detroit to take personal charge of the government's case against the company for $9,188,561.

Criminal prosecution in connection with the Lincoln Motors case, the attorney general stated, would be taken if any fraud were found.

"The government is going to prosecute this case to the limit," he said, "as has been our intention all along and to this end Assistant Attorney General Riter will go to Detroit to take personal charge.

The attorney general refused to deny or affirm charges published in Detroit papers that funds of the government, turned over to the company for use in connection with building Liberty motors, had been diverted to construction of automobiles and building up of the Lincoln plant.

"I have seen the charges and they may be true, or not true," he said, "but if they are true then the government will take criminal as well as civil action against the officers of the Lincoln Motors Company."

KELSEY TO MAKE GRAY BODIES

Detroit, April 28—Bodies for the new Gray line in both open and enclosed models will be made by the Kelsey Wheel Co., Inc., formerly manufacturer of a large percentage of the bodies used on the Ford line. Since the opening of the Ford body building plant at the River Rouge the Kelsey body plants in this city and in the south have been operating at low capacity. First bodies for the Gray are now being made and the company will speed up as production of Gray cars increases. The plants have a combined capacity for upward of 1000 bodies daily.

Durant Only Likely Bidder For Willys Elizabeth Plant

Auction Sale Decreed; $500,000 Is Possible Figure for the Factory

NEW YORK, April 29—Durant Motors, Inc., probably will be the only bidder for the big new Elizabeth plant of the Willys Corp., when it is put up at auction by the receivers. An auction sale has been decreed by the federal court and private sale of the property therefore is not permissible. No definite information is available as to the amount which will be bid but it is understood it will be about $500,000 less than the $4,000,000, which the receivers have asked Durant to pay. The original cost of the plant was about $10,000,000.

If Durant obtains the property as it is expected he will, it is probable the Long Island City factory which was equipped to turn out the Durant four, will be leased and the Elizabeth plant used to produce the Durant lines as well as the new Star. The primary purpose of the purchase, however, will be to provide space for assembling the Star in quantities.

Purchase of the Willys' factory would permit quantity production of the Star almost immediately, as well as increased output for the Durant four.

A. T. Stuart, chief engineer of the Durant Motor Car Co. of New York, and engineers representing the Continental Motors Corp., have been devoting their time for the past three weeks to thorough road tests of the Star. These tests have been made over rough country roads in Virginia and other southern states. They have been designed to demonstrate the endurance of the new car and are reported to have been entirely satisfactory. It is said the little car has averaged 30 miles per gallon of gasoline in the difficult tests to which it has been subjected.

WIZARD ASSETS SOLD

Charlotte, N. C., April 29—The final chapter in the career of the Wizard Automobile Co. was written when the assets of that company were sold by J. Lee Phillips to the Automatic Car Step Company for $105,500. The Wizard Company, which was organized for the purpose of manufacturing the Wizard Junior automobile, to sell for $395, attracted great attention for a time.

HIGH SPEEDOMETER READINGS

Indianapolis, April 28—Photographs of speedometers on Marmon cars showing high readings are being collected by the Nordyke & Marmon Co., manufacturers. Fifteen photographs showing readings ranging from 54,000 to 89,000 miles have been collected and reproduced in an eight page folder.

The READERS' CLEARING HOUSE

Questions & Answers on Dealers' Problems

Illinois Garage Owners Fire and Safety Regulations

Please forward complete information regarding Illinois Garage Owners' Law, requiring maintenance stations to be furnace heated, specially ventilated, wiring conduited and bond to be put up by owner. Please give a brief history of the law and how soon it must be complied with. What does it say in regard to the kind and construction of building such as brick with wooden floor? E. L. Russell, Colfax, Ill.

There is no law such as you outline applying specifically to garages as a class. The Legislature on June 24, 1921, passed "An Act in relation to the investigation and prevention of fire and dangerous conditions in and near buildings and other structures," being an amendment with additions to an older statute creating the office of state fire marshal.

Section 9 of this act, found in Chapter 73 under Insurance and paragraph 114, Cahill's Illinois Revised Statutes reads: "No person, being owner, occupant or lessee of any building or other structure which is so occupied or so situated as to endanger persons or property, shall permit such building or structure by reason of faulty construction, age, lack of proper repair, or any other cause to become especially liable to fire, or to become liable to cause injury or damage by collapsing or otherwise. And no person, being the owner, occupant or lessee of any building, or structure shall keep or maintain, or allow to be kept or maintained on such premises, combustible or explosive material or inflammable conditions, which endangers the safety of said building or premises.

"The Department of Trade and Commerce and the officers of cities, villages and towns by this Act charged with the duty of investigating fires, may inspect and examine at reasonable hours, any premises and the buildings and other structures thereon, and if such a dangerous condition or fire hazard is found to exist, shall order the dangerous condition removed or remedied, and shall so notify the owner, occupant or other person interested in the premises. Service of the notice upon the owner, occupant or other interested person shall be in person or by registered mail."

A similar section in the Act of 1909 was held unconstitutional, and the above was expressly substituted, so it is quite likely this is constitutional. In any event it is the law until the Supreme Court should decide otherwise. Note that the existence of "a dangerous condition or fire hazard" is a question of fact. Now, section 9a of the same act permits an appeal by the owner or other interested person within 10 days after receiving such notice, from orders of officers of cities, towns, etc., or from fire marshals and inspectors to the Department of Trade and Commerce. The department shall then make an investigation and shall either sustain or revoke the order. If the order is sustained, or if no appeal is made to the department it is the duty of the occupant to comply with such order.

Now if the Department of Trade and Commerce sustains an order against one he is still given a further appeal by section 9b of the Act to his County Court, "for the purpose of having the reasonableness or lawfulness of the order inquired into and determined." But this appeal must be taken within 10 days from the order of the department, otherwise one is deemed to have waived his rights to have the reasonableness or lawfulness of the order reviewed by a court, and one cannot avail himself of such defense in any court in which suit may be instituted for the penalty or the failure to comply with the order.

On appeal to the County court, the court may hear evidence as to the condition of the property in question, and it shall enter judgment either affirming or setting aside the order of the Department, or same may be modified according to the facts.

Wilful failure, neglect or refusal to comply with the order after it has become final by reason or failure to prosecute an appeal as mentioned above, or with the judgment of the County Court is made a misdemeanor, punishable by a fine of not less than $10 nor more than $50 and each day's continuance is a separate offense.

Now where an official gives notice the occupant is given 10 days to appeal to the Department. After the Department makes its ruling he is given 10 days more to appeal to the County Court, so time is of the essence of one's rights here.

You will see the requirement of the inspection as to heating, ventilation, wiring, etc., lies with the Department's views and rules as to what is necessary to make a garage safe from fires and explosions. The law has nothing to say about wooden floors, brick walls, etc., whether these things are safe is a question of fact.

Has Order From State Fire Inspector

On April 4 the state fire inspector called. He examined the building which I occupy and gave a notice to have all the wiring enclosed in metal conduit, have steam heat or hot water heating plant installed and to have a ventilator at least every eight feet along floor line on all outside walls. I do not own the building and my landlord refuses to make the required changes.

The order further states this must be complied with within 30 days from date. There is a fine of from $10 to $50 for every day thereafter until order is complied with. This order will compel me to go out of business as there is no other building to be obtained.

Can this order be enforced? Would I have to pay fine if I continue to operate?

It is not my building and wouldn't the landlord be more liable than I? I have heard this law is not constitutional. Is this correct?—P. L. Ely, Colfax, Ill.

You will find most of your questions answered in the answer to E. L. Russell.

The law makes either the landlord, lessee or occupant liable for failure to comply. Naturally this falls on you running the garage.

Whether you can enforce the landlord to remodel or repair the building to comply with the order depends on your lease or renting contract. But you two should get together for mutual advantages. Having had notice this would be evidence against you in claims for negligence arising out of fires and explosions about the shop.

You might appeal your case and show the unreasonableness of the order if that be the fact. Otherwise the order can be enforced and you would pay the penalty.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert and P. L. Dumas; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.

We are of the opinion the law is constitutional as being within the police powers of a state to protect its citizens. However, the order to you may be unreasonable, as you might make the garage safe in some more satisfactory manner from your standpoint.

Don't Put Repair Department in Basement

PLAN NO. 373

Q—I am contemplating building a garage or rather laying it out for my brother and would like to get some preliminary designs.

The ground is 100 ft. frontage on a paved carline by 130 ft. on paved street, both automobile highways one might say, making the corner a very good place for a filling station.

I want to figure on driving in under cover from either avenue or street and exit onto the street or avenue after filling and oiling. I want to have a very attractive, unique and efficient filling station.

The corner, 150 by 130 ft., is now occupied by a livery stable with concrete basement, the sides being about two ft. above the sidewalk so as to give head room and ventilation for the horses. This will be torn down and a fireproof, one-story building erected over the 100 by 130 ft., so the corner will be two stories, 50 by 130 ft., and used for a filling station. Paint shop, washroom, etc., will be on main floor, including office and accessories, while the basement will house the repair shop, battery shop, fender and radiator repairs, acetylene welding, blacksmith forge, wash shop, lathe, drill-press, etc.

The other 50 by 130 ft. on the corner will be used only for storage and I want to arrange the whole place to get the maximum number of cars in the storage room.

Kindly let me know your recommendation as to best layout for an attractive filling station, office, accessories, etc., so as to utilize the room most advantageously. The basement under the filling station will store the tanks of gasoline and oil so ground floor is not filled up with barrels which are in the way and look bad. W. L. Kinsell, Muskegon, Mich.

You are making a big mistake if you put all the repair and overhauling shops in the basement. The light here at best will be inferior and will gradually get worse as time goes on and the interior becomes grimy with oil and grease. Where mechanics cannot see very well, they take more time and do inferior work, consequently, your customers are dissatisfied both with price and work and go elsewhere.

It shuld be much better to use the back half of the new building for a first class daylight shop with plenty of skylights and use the basement for overflow storage.

It is not to be supposed that your storage space would be crowded all the time and it would simply be a case of the last comers getting what was left.

If the light is much better than usual basement light, a narrow space along the windows might be utilized for such purposes as welding and battery and tire work, but the parts away from the windows are useless without artificial light and that is bad. In case you follow our suggestion, the elevator would be better placed at A between the shop and garage where it could serve both without interfering with either.

The washrack could also go in the basement where the water could not leak down on anything below it. This in our opinion would be better use for the basement than shops of any kind.

By having the small building on the corner as indicated, the gas and oil station may be kept open at night after the accessory store is closed.

The filling station could be made smaller but if you want to take care of cars during a rush it is desirable to have room for them to get to the pumps without being in each other's way. This space will hold six cars without obstructing the sidewalk and, being roomy, will be much more attractive to gas customers than as if it were cramped.

Architectural Advice

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

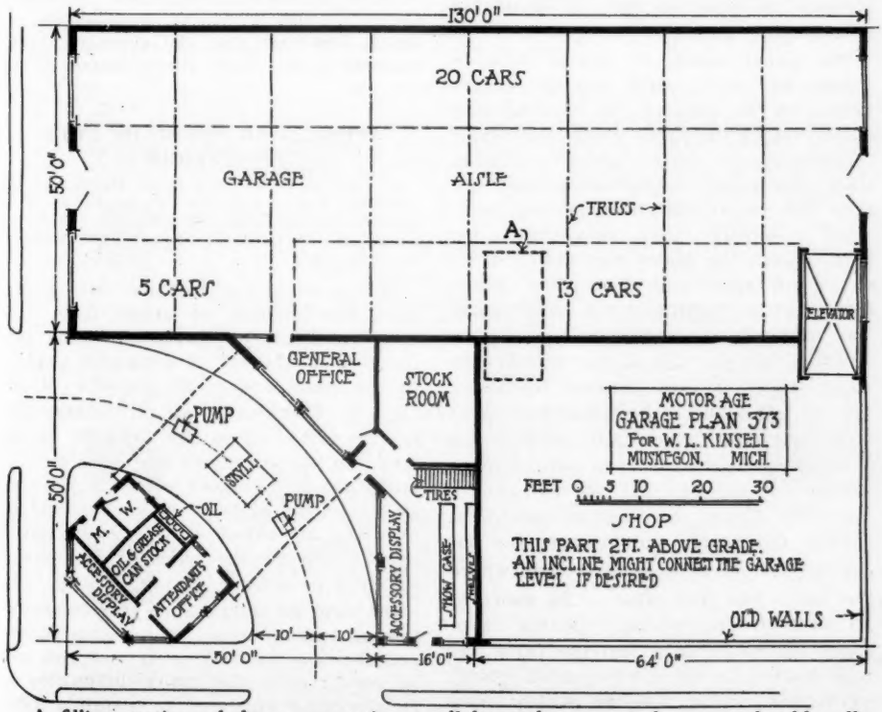
Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

And how much of an accessory department is anticipated.



A filling station of these proportions well located on a good corner should pull all the trade there is to be had

READER SUGGESTS REMEDY FOR DODGE GENERATOR TROUBLE

Q—In your issue of January 26, 1922 a reader from Ceresco, Nebr. described trouble with a Dodge generator. His trouble is so nearly a duplicate of the job that we had that an attempt will be made to tell the remedy that we found. The generator worked exactly as his did and was taken off and examined at a maintenance station and nothing found to be out of place. It was then sent to the factory and when returned was still in the same condition. Every known test was used but no defect located and yet we knew there was trouble some place.

Inasmuch as the generator would quit charging when the third brush was moved to a certain position, we figured that it must be due to a loose connection which made contact at times and at other times did not contact. We therefore began pulling on the various wires and when the wire to the third brush holder was moved it slid out showing that while apparently all right, it was not really soldered to the terminal. This condition was corrected and the generator has operated a year since that time and has not given any trouble. If the reader from Ceresco, Nebr., will try the above or have his service man try it we believe it will solve his difficulty.—J. C. Moore, Fredonia, Pa.

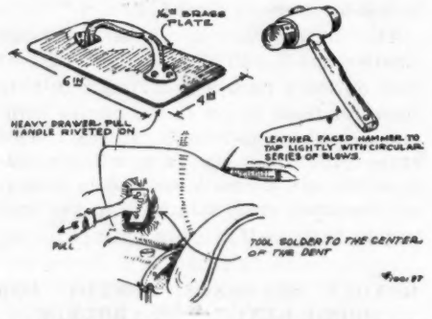
MOTOR AGE wishes to express appreciation for the above letter to the Clearing House for no matter how long one has been in the automobile business there are times when difficulties present themselves which seem to have no solution and co-operation of this sort proves helpful to all of us.

Taking Dent Out of Ford Sedan

Q—We wish to take a bad dent out of a Ford sedan. Advise what tools are necessary and how to go about it. The car in question was backed into a post and the dent is about 18 ins. long by eight ins. wide and three ins. deep. The material is not cracked and there are no sharp places in it.

2—Advise how to take up the wear in the clutch on a Franklin 1916. This clutch slips and we wonder if it is necessary to put in all new disks. Thompson & Kasper, Chana, Ill.

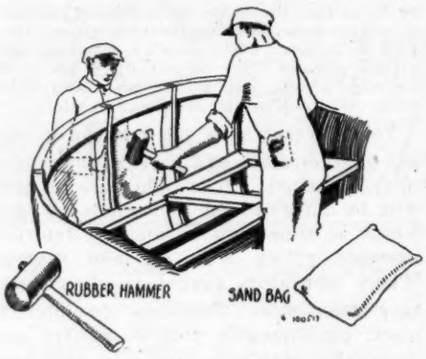
1—There are two methods usually followed to remove dents, one is that shown below, and is the method used where it is not feasible to remove the upholstering. The brass plate shown with the door handle should be made of a size that will be probably one inch to one and a half inch smaller than the dent to be removed. The plate should be sweated to the place in the body that has been dented in after this spot has been thoroughly cleaned and coated with acid. After the plate has been sweated to the



dent in the body one person should grasp the handle of the plate and exert a pressure outward while a hammer is applied to the metal around the edge of the dent, following the outline of the dent and tapping lightly which will tend to draw the metal outwards. This job is best done by two men with one man pulling outward on the drawer handle and another one tapping with the hammer as outlined.

After the dent has been removed it will be necessary to unsolder the brass plate and to finish off the remaining solder which can be done with a blow torch and a rag. It may be necessary then to refinish the rear of the car or panel. The hammering process used in connection with the brass plate may not bring immediate results and it may be necessary to follow around the outline of the plate or dent several time before any effect is produced, but nevertheless, the tap should be very light and repeated over if necessary a period of times that will bring the dent out. The bumping method shown in next column can be accomplished only after the upholstery has been removed at that particular spot. It consists simply in bumping the dent out while a second person holds a sandbag or other yielding material on the opposite side.

In both cases either a rubber or leather mallet should be used.



2—There is no regular adjustment on the clutch of the 1916 Franklin. This clutch operates in oil and should it show any tendency to slip it is due no doubt to the plates being worn. Additional spring pressure on the clutch lengthens the life of usefulness of the present plates. This would mean that it would be necessary to install a larger washer behind the main clutch spring. A recommended practice, however, is to install new disks.

A QUESTION ON VALVE SETTING

Q—In timing valves when you say for instance, intake opens 9 degs. after upper dead center do you have the cam just touching the valve or do you start the valve to lift at 9 degs. after dead center? —H. Walter, Princeton, Ill.

In timing the valves on an automobile engine where it states the intake open 9 degs. after upper dead center it means that the intake valve should just start to leave its seat. Often times this point is determined by placing a piece of thin paper between the tappet and valve stem and when this paper becomes caught between the valve stem and the tappet it shows that the tappet has raised by striking the cam and that is considered the opening point.

The paper should be placed between tappet and valve stem and the engine turned in the direction of rotation very slowly trying the paper whilst the engine is being turned until a point is reached where the paper cannot be released and then the engine should be turned backward slightly to determine the point where the paper was clamped between the tappet and valve stem. When this point is found it is the point where the intake valve is opening.

When setting valves for closing the same course can be pursued the paper may be left between the tappet and valve stem and with a constant pressure on it either by another person pulling on it slightly or by the use of one of the operato's hands the engine should be turned and at the point where the paper is just released is the point where the valve has just closed. In short in all valve timing where it states valve opens the meaning is that the valve has just started to open, and at all points where the timing diagram states valve closes the valve has just completely closed.

TROUBLE WITH NORTHEAST GENERATOR

Q—We have a Northeast generator which is provided with third brush regulation and which charges all right at low speeds. When car speeds up to 10 or 15 miles per hour, however, it will cut out the charging current entirely and no regulation of the third brush will check this condition. Advise what may be the trouble.—C. K. Tashima, Fort Lupton, Colo.

1—This appears to be a case of an eccentric commutator, possibly due to the armature having been turned in a lathe without sufficient care being taken to see that the commutator was turning concentric with the lathe centers. In turning up these armatures which revolve at very high speeds it is best if possible to turn them in their own bearings.

To check up this condition, however, you can run the generator and at the instant that it cuts out, have the commutator cover removed and apply a little extra pressure on the brushes and if this causes the generator to again charge it shows the trouble is as above indicated. If eccentricity of the commutator is not the trouble it would be well to look for loose connections in the field circuits or loosely solder wires in the commutator which may be all right at low speeds but jar loose at high speeds.

To test the armature for loose connections at high speeds, it is well to run it on a test bench with the field circuits disconnected so that a low reading voltmeter can be used across the main brushes to check up the voltage developed on residual magnetism only. The readings on this voltmeter should increase directly proportional to the speed, but if at a certain speed they suddenly drop off and the voltmeter flickers it shows trouble in the armature. Of the preceding suggestions we think, however, that the eccentric commutator is the most likely cause of the trouble.

INCREASING SPEED OF POPE HARTFORD

Q—We have a 1914 Pope Hartford six cylinder and would like to know if it is possible to increase its speed to 200 miles or 250 m. p. h.—J. K. Wilson, 318 Monroe St, Gary, Ind.

We know of no practical way to secure this amount of speed from this car. It might be possible by using just the proper amount of dynamite applied to the exact center of pressure of the chassis. However, in all seriousness this is impossible to realize because of the fact that the resistance increases by certain ratio to the speed which is not constant and the amount of power required to drive an object at this speed probably would be the cube of the power required to drive it at 100 m. p. h.

Off hand we should state that to secure this amount of speed it requires in the neighborhood of 3,000 h. p. and you can at once realize the many difficulties to be overcome were you to install a 3,000 h. p. engine in this six cylinder 1914 Pope Hartford chassis.

First Determine Voltage for Which Coil is Designed

Q—We have a 1915 Model K Hupmobile with 12 volt starting and lighting system, also 12 volt ignition and we are having considerable trouble with this ignition system, due to burning of the interrupter contact. We have reversed the wiring but cannot keep the points from burning and would like to change this from a 12 volt to 6 volt ignition. Advise how this can be done.—H. B. Monroe, Vandalia, Missouri.

1—We do not believe it will be necessary to change the ignition system in order to overcome the trouble and would suggest that you check up the coil and see if it really is a 12 volt coil. This can be done by measuring the current which the coil draws when connected to a 6-volt battery with an ammeter in series. If it draws 5 or 6 amperes on six volts it is the proper coil but if it draws 10 or 12 amperes on six volts it is designed for a six volt system and accounts for the trouble you are having with the contact when using it on a 12 volt system.

If you find that the coil is the correct one then the next possibility is that it is not properly connected as this coil contains a condenser and improper connection will not give you the condenser connected across the interrupter points which is required for correct operation. We believe that on this coil you will find one terminal marked interrupter, another one marked either battery or switch and the third terminal marked switch and interrupter.

Care should be taken to connect the two terminals marked interrupter to the interrupter so that the condenser will be properly connected. It is also possible that the condenser is opened, that is, disconnected inside of the coil box and to test this would suggest that you rig up a 110 volt tester by connecting up a 110 volt light in such way that current comes through the light to one of your test points and comes directly from the other side of the 110 volt circuit to the other test point. By touching the test points to each other this will make the test lamps light up.

If these two test points are now put in contact with the terminals marked interrupter which should be the condenser terminals and while kept in contact with these terminals the test points are allowed to slide along until they make contact with each other, the result should be a very snappy spark due to the condensor. However, if the spark should be very slight and about the same as when the test points are touched to each other up in the air, it shows that the condensor is open.

Should the lamp light up, however, when the test points are put in contact with the terminals marked interrupter it would show the condensor to be punctured, which would also prevent getting a good spark at the spark plug. This test must not be confused, however, with the lighting of the lamp when you make contact across the primary winding terminals, for it is normal for the current to flow through this circuit.

ANGLES OF 8-CYLINDER ENGINE

Q—We would like some information in regard to the angle through which an eight cylinder engine turns in between firing strokes and as to whether this angle is affected by the angle between the two sets of cylinder blocks.—R. S. Denton, Galesburg, Ill.

Every cylinder no matter whether built into a two cylinder engine or into an eight cylinder engine must fire when the piston is approximately at top dead center. For this reason any eight cylinder engine built with a cylinder block at right angles or at 90 degrees to each other will fire evenly or every 90 degrees, while an eight cylinder engine with a cylinder block left at an angle of 60 degrees will fire first with 60 degrees in between explosions and then 120, continuing to fire in this manner every 60 degrees and every 120 degrees alternately.

This is based on the fundamental fact that the piston must be at top dead center and we see no way in which a 60 degree engine could fire at 90 degree intervals.

This does not mean, of course, that the 60 degree motor is not a good type, as the length of the power stroke is such that the different power strokes overlap each other in either motor. Of course, the 90 degree motor is theoretically more even as far as power impulse is concerned, although practically we doubt if there is much difference. The 60 degree eight possess certain characteristics of balance that are claimed superior to the 90 degree eight.

CORRECT VALVE AND IGNITION SETTING FOR FRANKLIN 9A

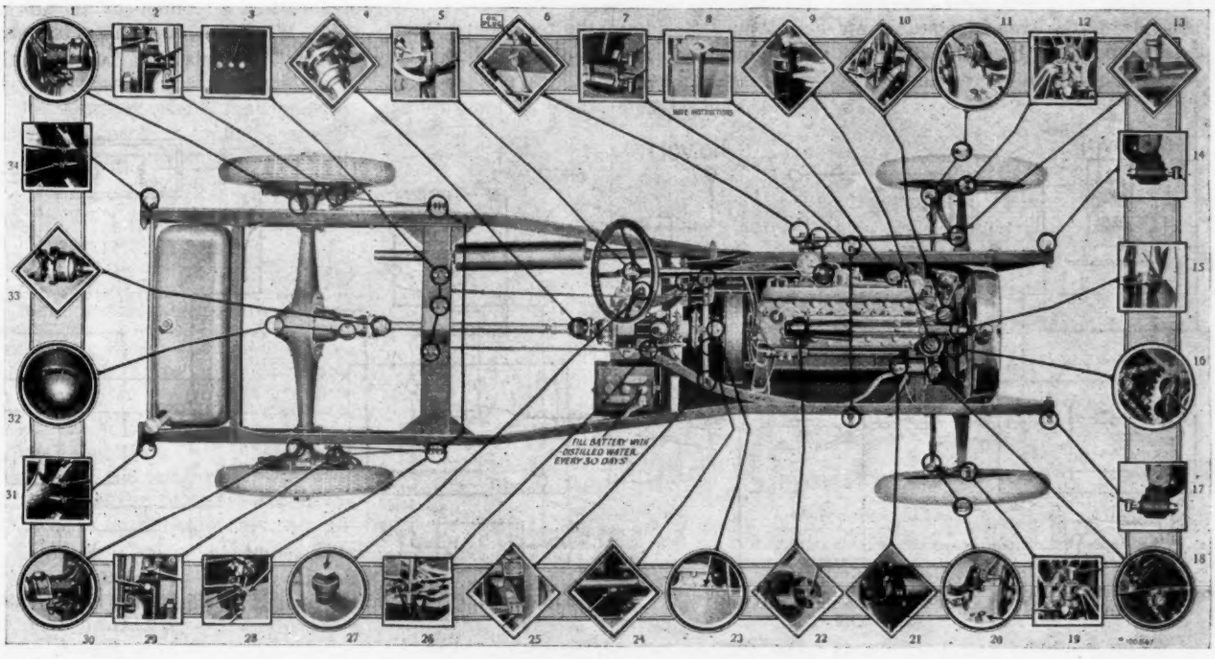
Q—Give the correct valve and ignition setting for the Franklin series 9A—Chas. Stants, Owasso, Okla.

The intake valve on the Franklin 9A should start to open when the flywheel is one inch from the upper dead center point. That is, the intake valve should just start to open one inch measured on the flywheel before the upper dead center position of the piston. The spark timing should occur from 1½ to 2 inches before the upper dead center position measured on the flywheel.

LUBRICATION CHART FOR 20 STUDEBAKER

Q—Supply me with lubrication chart and instruction book on Studebaker special Six series 20. Ehnes Garling, Superior, Iowa.

A lubrication chart for the series 20 Studebaker car is shown below.



Lubrication Chart for Studebaker Special Six, Series 20

How to Make and Use an Ignition Tester

Q—Advise some simple way of testing all makes of ignition coils such as Remy, Delco, Atwater Kent, Connecticut, etc. Also show with sketches and explanation of metnod of properly connecting such coils. J. E. Wismer, Alliance, Ohio.

1—If you are considering the purchase of an ignition testing device, would call your attention to the fact that these are constructed in two general ways. One, in which a hand operated interrupter is used or perhaps a vibrating interrupter is available while in other types a mechanically driven interrupter is employed. Our preference would be in favor of the mechanically driven interrupter although the hand operated interrupter gives fair operation, while the vibrating type is not always so satisfactory. Name of concerns which make ignition testers will be given by letter. Should you desire, however, to build up something of the kind the sketch shown in Fig. 1 may be helpful.

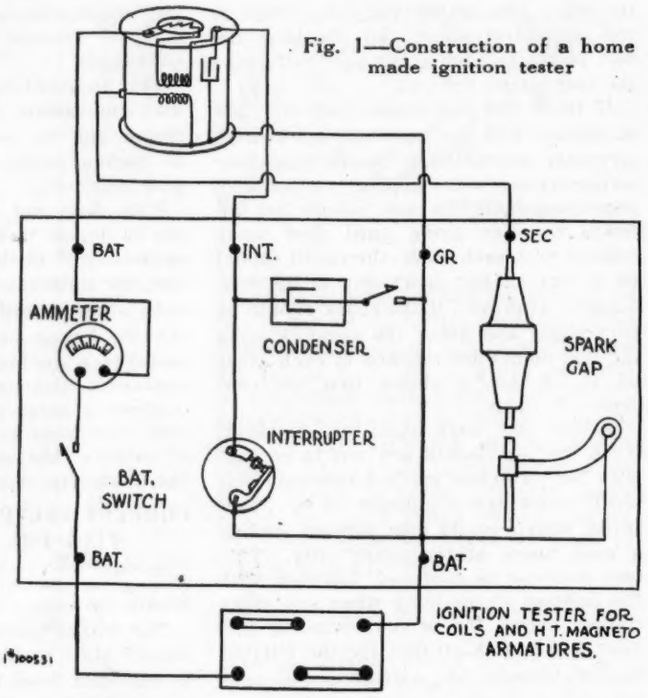


Fig. 1—Construction of a home made ignition tester

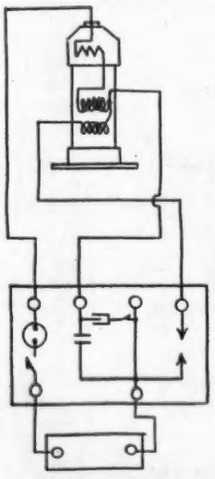
For a spark gap we have shown the porcelain and center electrodes from a spark plug used as one side of the gap while the center electrode only from another spark plug is used as the grounded side of the gap. You will notice that the grounded side of the gap is mounted on a pivoted support so that the distance across the spark gap point can be varied by swinging the arm around the pivot. If connected as shown no shock will be obtained when moving this grounded support. The interrupter that we have shown on the test board can be any interrupter that is available. For example, a Connecticut, Remy, Atwater Kent, Wagner, Northeast or any similar type can be used, although it would be preferable to use one that does not have a condensor built in it. If you have available an interrupter that has a condensor in it, it could be removed and used for the spare condensor as shown in the upper part of the test board.

At the left side of the test board there is shown an ammeter and a battery switch although these could be eliminated if so desired. In this case the interrupter should always be left with the points opened when it is desirable to have no current flowing.

The trick in using any ignition tester is in properly connecting the coils and as far as we know there is no ignition tester made that can be operated by a man who has no idea of ignition systems. In Fig. 1 we have shown the ignition tester connected up to a Remy coil and in this case the trick is to connect the test board terminal marked interrupter (Int.) to the common terminal which serves both the primary winding and the condenser. The other end of the primary circuit goes to the Bat. terbinal on the test board while the base is connected to the Gr. terminal which serves both the condensor and the ground end of the secondary.

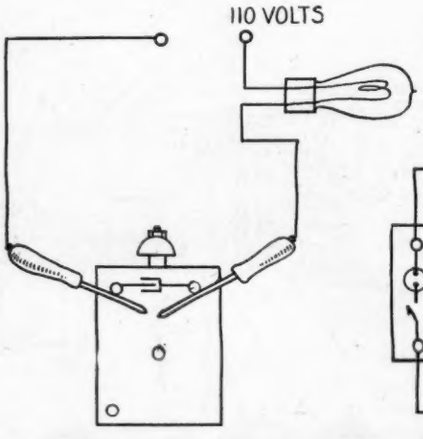
The live end of the secondary is then connected to the Sec. terminal on the test board which carries the high tension spark to the spark gap. In the construction of the test board it would be possible to drive the interrupter with an electric motor or a wheel and handle could be put on so that it could be turned by hand or if high speed is desired perhaps a 1 in. pulley could be put on the interrupter shaft and 8 or 10 in. pulley belted to it, so that turning the large pulley gives high speed to the interrupter.

It will be found, however, that operating the interrupter at a fairly low speed will check the ignition coil better than at high speeds, as it is easier to tell whether the sparks are missing or not. To test an unknown coil the first thing to do is to find out what is inside of the coil and in Fig. 2 is shown a method of locating a condensor in an ignition coil. When the condensor is found, the proper terminals will be those through



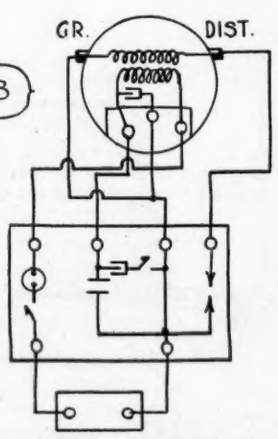
TESTING ATWATER KENT COIL

Fig. 5



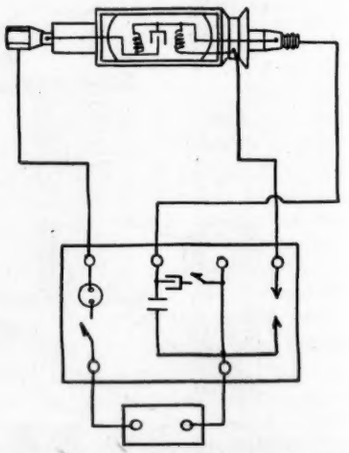
LOCATING CONDENSER IN IGNITION COIL

Fig. 2



TESTING CONNECTICUT COIL

Fig. 3



TESTING HIGH TENSION MAGNETO ARMATURE

Fig. 4

which no current will flow as indicated by the lamp failing to light. However, as the test points are kept as shown in Fig. 2 and gradually slid along the terminal, until the points touch together there will be a snappy spark at the tip of the test points which indicates that the condensor has been located. Should the condensor location be known, however, and the lamps light up through the condensor it would prove it to be punctured and would show that a new one was required. After the condensor has been located the primary circuits should be found and this can usually be determined easily by the appearance of the coil or by the terminal which gives a good circuit as shown by the lamp lighting up. Another way to test for the primary circuit is with a 6-volt battery and an ammeter an ordinary 6-volt closed circuit coil drawing approximately 5 amperes. After the internal circuits of the coil have been figured out it will be found that there is always one common terminal which is serving both the primary circuit and the condensor, that is, when the coil includes a condensor. This terminal should always be connected to the Int. terminal on the test board. The other end of the primary circuit should go to the Bat. terminal, the live secondary should go to Sec. on the test board and the other end of secondary and condensor should go to Gr. terminal. In Fig. 3 will be seen the method of testing Connecticut coil which is based on the above principle. In Fig. 4 will be seen method of testing a high-tension magneto armature. In this case it is impossible to get the condensor in the armature properly connected with respect to the interrupter on the test board so that with the condenser switch opened, fair sparks should be obtained at the spark gap and with the condensor switch closed the sparks at the test gap should be improved. When ignition coils are being tested the general rule is to leave the condensor switch open when a condensor is in a coil and close it when there is no condensor. For example, in Fig. 5 the Atwater Kent ignition coil having no condensor it is necessary to close the condensor switch to get proper results.

ELIMINATING GEAR GRINDING ON 1917 CADILLAC

Q—What can I do to eliminate the grinding of gears in the transmission of a 1917 Chummy Roadster Cadillac when shifting gears? Are there any adjustments in the transmission that can be made to take this noise out? Show sectional view of transmission and show what adjustment to make. Chas. A. Brown, Baltimore, Md.

Our first diagnosis of this trouble would be that the clutch is dragging causing the grinding of gears when the shifting lever is moved into any gear position. If the clutch driven member does not stop immediately when the clutch is disengaged it will be practically impossible to shift gears noislessly.

The first remedy is to thoroughly clean out the clutch as portions of the asbestos facing and other foreign matter may collect in between the disks and cause them to drag against each other when the pedal is fully depressed.

We are showing a sectional view of the Cadillac transmission and transmission control. The teeth of the transmission gears should mesh so that the sides of the two gears in mesh will be flush with or at least not to exceed 1-16 in. of being flush. However, these gears are not liable to require a readjustment. If you wish to check up on this remove the control lever to the low gear position.

Then loosen the lock nut K and tighten the adjusting nut L thereby moving the shaft M endwise until the sides of the teeth of the two gears in mesh are flush then tighten the locknut K. The adjustment of the transmission countershaft is effected by the adjusting screws.

The jackshaft N should be so adjusted that the sides of the teeth of the gear A are flush with the sides of the teeth of the gear I. After making this adjustment a clearance of about .010 of an in. should be left at each end between the end of the shaft and the adjusting screws.

REPAIRING RADIATORS

Q—Give us information on repairing radiators including method of cleaning the whole radiator core, also information for dipping the core, both in soldering solution.—Clyde C. Henderson, Calgary, Sask.

1—The equipment which we would recommend for repairing radiators is as follows: First, an Oakite Platers' Cleaner tank. This would be a sheet iron tank about 4 ft. square x 2 ft. deep heated by a gas flame underneath. This should be filled with water and kept at a temperature of about 200 degrees and OPC should be added one pound to every gallon of water.

This OPC is a chemical which can be obtained for the purpose of making the clean solution. This tank with a very small upkeep will last for many months. Next to this should be a rinse tank of running water. This may be cold. Next to this should be a tank of sheet iron about the same size as the Oakite tank, also heated with gas underneath.

This should be filled with a saturated solution of Hydrochloric Acid and ordinary zinc metal, this should be used at a temperature of about 180 degrees. The mode of procedure is as follows: 1—Remove radiator core from the shell and boil it in the OPC solution until all of the paint, grease, etc. is softened up or removed.

2—Put radiator in the rinse tank and brush until clean on the outside.

3—Blow out tubes with compressed air.

4—Immerse in the acid and leave until the oxide scale, etc. is removed. It is now ready to have the metal solder either poured or put on with a blow pipe.

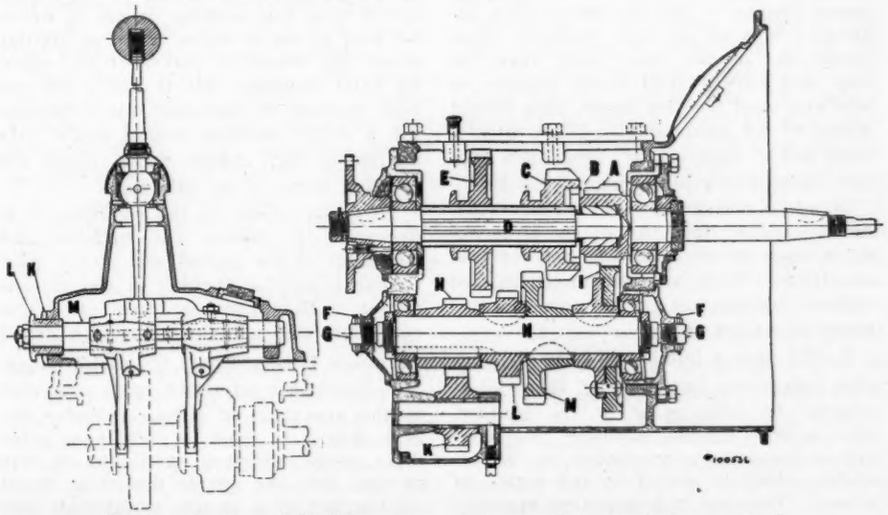
EXIDE BATTERY FOR CHEVROLET

Q—We have a 1920 Chevrolet touring car which needs a new battery and we have figured on installing an Exide. We would like information, however, as to which of the following three types would be best for the purpose. 3-D-X-11-1-S known as Exide junior or the 3-XC-13-1, or the 3-XC-13-1, or the 3-XC-15-1. We would like to use the first named that is the Exide junior if it will be suitable. O. A. Bygland, Lankin, N. Dak.

The number 11, 13 and 15 in the three batteries mentioned denotes the number of plates used in each cell, and the battery recommended by the Exide people for use in the Chevrolet is the 15-plate battery, that is, the 3-XC-15-1 battery. While the smaller battery would cost less and might serve for a while, it would be found that the life would be shorter because the plates would be worked harder than in the larger battery, so that in the long run it might be more expensive than the larger size.

TAPPET CLEARANCE CORRECTION

In March 23 issue on page 44, L. H. Parks, of Peabody, Kansas, explains a light tapping knock noticeable in a 1921 Nash. In this article it was stated that the tappet clearance should be .001. This dimension was incorrect due to a typographical error and should have read .015.



Sectional view of Cadillac transmission and transmission control

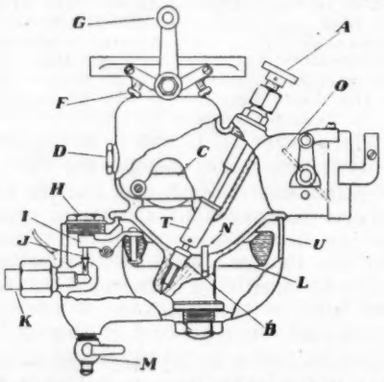
KINGSTON CARBURETER AND MAGNETO

Q—Publish sectional view of Kingston carbureter used on 4½ by 5¾ Waukesha motor and give instructions for its adjustment.

2—Publish view of Kingston magneto, showing adjustment of contact breaker.

3—Would like your opinion of regrinding cylinders. Some say it is impossible to do so without forcing some of the emery into the surface of the iron and they maintain that this fine cutting agent soon undoes all of the work of regrinding and leaves the cylinder wall as bad as ever. What is your opinion? Gerald F. Hoffman, Princeton, Ill.

1—The sectional view of the Kingston carbureter is shown below. To adjust the carbureter retard spark fully and open throttle about 5 or 6 notches on the quadrant on steering post. Loosen needle valve binder nut on carbureter until needle valve turns easily. Turn needle valve A until it seats lightly. Do not force. Adjust away from seat 1½ turns. This will be slightly more than necessary but will assist in easy starting. Start motor and open or close throttle until motor runs at a fair speed (not too fast), and allow it to run long enough to warm up to service conditions. Now make final adjustment.



KINGSTON CARBURETOR SECTIONAL VIEW 100527

This carbureter has but one adjustment needle valve (A). Close throttle until motor runs at desired idling speed. This can be controlled by adjusting the stop screw (F) in throttle lever. Adjust needle valve toward its seat slowly until motor begins to lose its speed, thus indicating a weak or lean mixture. Now adjust the needle valve away from its seat very slowly until motor obtains its best and most positive speed. This should complete the adjustment. Close throttle until motor runs slowly, then open rapidly. Motor should respond strongly.

Should acceleration seem slightly weak or sluggish, a slight adjustment of needle valve may be necessary to correct this condition. With adjustment completed tighten binder nut until needle valve turns under tension.

2—We have a number of cuts of Kingston magnetoes but none of them show clearly the adjustment of the contact. This is very simple, however, the moving contact being mounted on a flat spring which is moved by the action of a cam. The cam in a Kingston magneto is different from that of most magnetoes in as much as it resembles a flat washer with two bumps punched in it and these bumps operate against a fibre piece on the flat spring which produces the necessary make and break of the contact.

This action of the interrupter contact can be easily seen by removing the interrupter cover and it will then be observed that there is also an adjustable contact which can be moved by loosening a jam nut and turning the screw on which the contact is mounted. An opening of 10 or 12 thousandths in. should be such as to give satisfactory operation.

3—The use of the emery wheel for regrinding cylinders has been universal not only in regrinding but in making the cylinder block in the first place, as some years ago there was practically no other method used. As this method has been so extensively used in the manufacture of cars it is apparent that trouble in regrinding must be due to failure to wash out the cylinder thoroughly after the grinding process which may account for the wear sometimes experienced after such job has been carelessly done.

PROPER VALVE SEATING OF FOUR CYLINDER ENGINE

Q—How can we tell when the valves of a 4 cylinder engine are not seating properly?

2—What are the three principle parts of a four cylinder engine?—A Reader, Petaluma, Calif.

1—Failure of a valve to seat properly may either be due to pitting of the surfaces so that when the valve is seated it does not make an air tight joint or it may be due to the valve stem sticking or valve being warped or burned. If the engine is turned over by hand it is possible to tell by the compression whether a cylinder is holding air well or not and if any particular cylinder does not have much elasticity or spring to it and permits cranking very easily, it shows a leak somewhere. Although, of course, it may be due to the valve or it may be due to leakage past the piston ring.

In order to check up the valves to see if they are sticking or not it would be well to use a valve lifter or similar object and work the valves up and down by hand although this is not a 100 per cent method of checking this condition, for a slight sticking action might give trouble at high speeds which would not perhaps show up on this test.

To really check up the condition it is necessary to inspect the surfaces and condition of the valves and stems. Also to check up the surface of the pistons to see if they show a brown or burnt condition which indicates a leakage of explosion pressure past the piston rings.

2—There are so many parts essential to the operation of a four cylinder engine that it is hard to give three principle parts although it would be our opinion that the engine design is based on the use of a piston, crankshaft and connecting rod.

FROM RADIATOR TO TAIL LIGHT

Q—Is there any engine manufacturer using the Kant-Skore pistons? I understand the Oakland and Essex are using a different piston than previously.

2—In reading about the new Velie model M58 the bore is given as 3½ and the S. A. E. h. pp. 23.4. This rating calls for a bore of 3⅛—am I right or wrong?

3—Publish a diagram of the rear axle.

4—Are they using the Borg & Beck or Dooley clutch?

5—We have a car that is either a Vogue or an Economy it has the 7W Continental engine, car No. 580, model 646 and is supposed to be a 1920 model. It has a Dursten transmission with a short lever. We think the long lever was put on in 1918 or 1919. What kind of axles and bearings are used, steering gear? Publish diagram and show adjustments.

6—Why are the fan blades turned in the opposite direction which means that you have to use a crossed belt?

7—What month and year was this engine and car manufactured?

8—Is the car still being manufactured.

9—Have you heard anything good of the Miles one piece triple steel piston ring?

10—What is the wall pressure in pounds of the Gill ring 3¼x3/16 in. size?

11—What month and year was 7W 95056 Continental engine made?—Geo. Hendry, Portland, Oregon.

There are several cars using the Kant-Skore piston they are the Maxwell and Essex and perhaps some others.

2—You are entirely right in your assumption that the bore should be 3⅛ in. This was due to a typographical error and should have read "3⅛ in. bore."

3—There is no diagram available of the latest type of Velie axle, however, we can inform you that this is the product of the Timken-Detroit Axle Company, who do no doubt would be able to supplyyou with the diagram of this axle.

4—The Dooley Clutch is standard equipment on the series 58 Velie car.

5—The axles are built by the Salisbury Axle Company. The front wheels being equipped with roller bearings and the rear axle with ball bearings. A Ditweiler steering gear was used. We regret to state that we have no illustration of either the Salisbury axle or the Ditweiler steering gear. The Ditweiler steering gear as used on this car was manufactured by the Ditweiler Manufacturing Company, Galion, Ohio. The rear axle was manufactured by the Salisbury Axle Company, Jamestown, New York.

6—This fan probably was designed for an engine having the opposite rotation to the one on which it is now installed.

7—The serial numbers are not available on the Vogue or Economy car. Neither is it possible to determine the vintage of the car by knowing the serial number. We have communicated with the Continental Engine Company but have as yet received no reply. Upon receiving an answer we will advise you.

8—The car known as the Vogue is manufactured by the Vogue Motor Company, Tiffin, Ohio.

9—Yes.

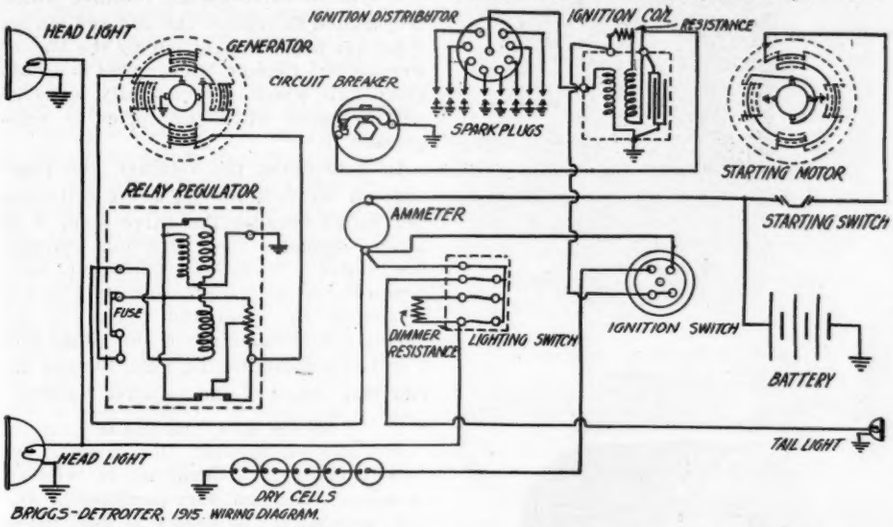
10—Approximately 10 pounds.

11—We have not this information in our files but will forward it to you as soon as we have secured the data from the Continental Motors Company.

WIRING DIAGRAM OF BRIGG'S DETROITER

Q—Supply wiring diagram for a Brigg's Detroiter and state when this car was manufactured and also the price.—Rainbow Motor Repairing Co., Brooklyn, N. Y.

The wiring diagram of a 1915 Brigg's Detroiter is shown below. This car was manufactured during 1914 and 1915 and the price was $985.



BRIGGS-DETROITER, 1915 WIRING DIAGRAM.

M. P. H. OF PAIGE MODELS

Q—Advise what m. p. h. the different models of Paige will make. Models from 1918 to date.—E. B. Eidney, Williamsburg, Mo.

During 1918, 1919 and 1920 two chassis were produced by the Paige Co. known as the model 55 and the model 39. The larger car having an approximate maximum speed of 55 and the smaller car approximately 50 m. p. h. Beginning with 1921, two chassis were introduced and are in production known as the model 44 which was changed from the model originally known as model 42 and model 66.

The models 42 and 44 have a maximum speed of approximately 55 m. p. h. while the model 66 has a maximum of approximately 70 m. p. h. These figures are not to be considered as anything except approximations of the average speed of an average run of stock cars.

APPLICATION OF BIJUR TO PACKARD

Q—Publish internal diagram of Bijur generator and regulator used on the series 3-35 Packard car.

2—Explain how to locate trouble whether in generator or regulator.

3—Give instructions for removing a generator from car.

4—When reversing, polarity reversing switch on regulator the ammeter reads in the wrong direction. What is most likely to cause this trouble?—Battery Service Co., Woonsocket, R. I.

1—As you have copies of MOTOR AGE for two years back, we refer you to issue of June 16, 1921. The diagrams you need are in "The Clearing House" in an article headed Bijur Generator Regulation.

2—To find out whether trouble is in generator or regulator would suggest your removing regulator and making a connection from the number 3 tubular connection in the generator to one of the conections on the disconnect switch plug. Number one and number two tubular connection on the generator should now be shorted together and a wire connected from this short circuit carried to the other terminal of the disconnect switch plug.

This will allow the generator to operate without any regulator or cutout switch and, of course, when you first make this connection before the engine is started up the generator will draw 15 or 18 amperes from the battery and show this discharge current on the ammeter. However, just as soon as the engine is started this discharge current on the ammeter should rapidly come up to zero and the ammeter hand should continue to move over to the charge side perhaps going all the way off the scale at high engine speed due to having no regulation.

If the generator does as above indicated there is nothing wrong with it and difficulty can be blamed on the regulator. If this is the case it is most likely due to failure of the regulator contacts to make good connection with each other, possibly on account of their being badly burnt. It is also possible that the spring tension is weak so that the contacts are not held firmly together.

3—To remove generator from model 3-35 Packard car proceed as follows:

Disconnect switch plug and remove regulator from generator. Remove radiator. Take out four capscrews that hold inspection cover opposite end of generator shaft and remove this inspection cover. Remove locking wire which holds two fillister head screws and take these screws out. Pull off couplings being sure to catch the Woodruff key so that it will not fall down into the crankcase. In doing this work it is not necessary to disturb the timing chain nor sprockets. Next remove a large nut which has left hand thread. This finishes the work at the front end of the generator. Now remove two capscrews from underneath the generator, these being the ones which hold it on the bracket. It is next necessary to remove the water pump and move it backward toward the starting motor after which the the generator can be lifted off.

4—When reversing battery connection to the generator causes the ammeter to show discharge it usually means that the battery really is discharging. This is often due to vibrating action of the cutout and is usually observed only on cutouts where the moving arm is very light. We would suggest that the next time you reverse this plug from the direction in which it shows charge to the direction in which it has been showing discharge that you take the cover off the regulator and close the cutout points once by hand. This will allow current to flow from the battery to the generator and magnetize the fields in the right direction. Of course, as you do this the ammeter will show discharge temporarily but the fields of the generator being magnetized in the right direction should cause the ammeter to show charge when the engine is again started.

MEAGER DETAILS AVAILABLE ON HENRY CAR

Q—Can you give us information as to make and manner of adjustment of clutch on the Henry car?

2—What would cause lights to be rather dim on a Studebaker 1915 except when motor is not running or is running 20 m. p. h.? Generator seems to keep battery charged all right.—Reader, Des Moines, Iowa.

1—We have no description of the Henry car wherein the clutch is described. We will supply by letter, however, names of firms who can probably supply parts for this car.

2—The brightness of the lights should not be effected by the action of the motor except when the speed of the engine is fast enough so that the generator starts to charge the battery at which time the voltage will come up a little bit and the lights will be somewhat brighter. The generator is supposed to be connected to the battery by the automatic action of the relay at a time when the generator voltage is higher than the battery voltage.

It is possible that the spring in the cut-out or relay is too weak and that the cut-out points close while the generator voltage is still lower than the battery voltage which allows the generator to take current from the battery lowering its voltage a trifle and making the lamps slightly dimmer than normal.

To check this condition we would suggest your disconnecting one of the wires from the generator and hooking an ammeter in series with this circuit. As the speed of the engine is gradually increased it will then be possible to determine by the ammeter reading whether current becomes a charging current as the relay contact closes or whether it first goes over to discharge and then at higher speed becomes a charging current. If it does this the spring tension in the relay should be increased as previously suggested.

The ACCESSORY SHOW CASE

New Sources of Retail Profit

BARROTT VAPORIZER

The Barrott Vaporizer is a dual principle vaporizer using mechanical and thermal methods of carburetion. It consists of a cone-shaped screen placed in the manifold at the junction of the manifold and cylinder block, next to intake valve chamber. The conical screen is attached to a special gasket which replaces the regular gaskets. Price per set for Fords, $1. Barrott Stamping Co., Shelbourne Falls, Mass.

A C SPEEDOMETER FOR FORDS

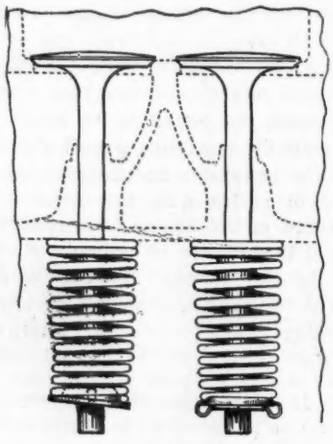
The dial face of the A. C. speedometer for Fords is jet black with the numerals in white. A 100-mile trip register, with tenths and a 100-mile total register are provided. Miles per hour from 1 to 70 can be shown. The A. C. is driven from the right front wheel, and the drive assembly can be attached without drilling holes in hub flange or spokes. Three of the regular flange bolts hold the flexible shaft by a coupling which eliminates the need for a swivel. A. C. Spark Plug Co., Flint, Mich.

"APEX OIL RITE" PISTON RINGS

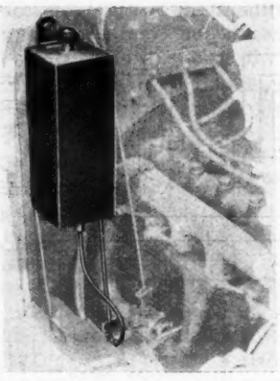
Apex "Oil-Rite" piston rings have a step cut joint, and an oil groove, which, it is claimed, insure proper lubrication and forms a power-tight and leak-resisting seal for every ring. Thompson- Friedlob Mfg. Co., Peoria, Ill.

TABOR EMERGENCY RESERVE FUEL TANK

This tank is made for Fords and fits under the hood. It will hold sufficient fuel to run the car 10 miles. In climbing hills it insures a steady flow of fuel to the carbureter. A control through the dash facilitates immediate use of reserve fuel. Price $3. Tabor Auto Specialty Co., Huntington, W. Va.



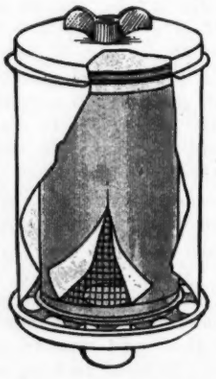
Master spring retainer



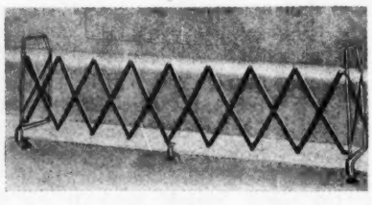
Tabor emergency reserve fuel tank

Gimick tire inflator

Monarch spring bumper



Orem air cleaner



Pioneer luggage carrier

MASTER SPRING RETAINER

A type of valve spring retainer which is designed to replace the cup and spring type, has been brought out by the Master Primer Co., Detroit, Mich. This is a one-piece unit which automatically locks itself in place when the spring is compressed.

In assembling the retainer, the pressure on the retainer opens the self-locking wings because the valve stem is of larger diameter than the hole through the wings. When the spring is fully compressed, the wings are caught in the groove of the stem and release of the spring compression snaps the wings into a locked position on the stem, forcing the cup and wings of the retainer together.

OREM AIR CLEANER

Air passing through this cleaner before entering the carbureter is relieved of foreign dirt and dust particles by the felt covering. The device is said to be automatically self-cleaning in that the vibrations of the vehicle shake down all residue letting it fall through the bottom of the cleaner. Orem Motor Protector Co., 2827 N. Calvert st., Baltimore, Ohio.

PIONEER LUGGAGE CARRIER

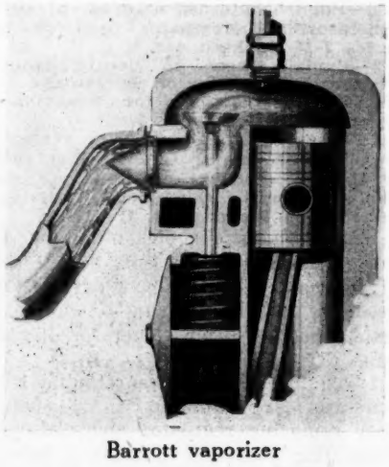
This carrier when folded lies flat in a compact manner on the runningboard or can be detached and placed under the seat. Made of steel, black enameled. Price $3.50. Brewer-Titchener Corp., Cortland, N. Y.

MONARCH SPRING BUMPER

The Monarch spring bumper is made in sizes to fit all cars. Edward F. Lyon Co., 1600 East Euclid ave., Detroit, Mich.

GIMICK TIRE INFLATOR

Gimick tire inflator will inflate a tire to 55 or 60 lbs. without a jack. Can be refilled. Gimick Tire Inflator Co., 1323 Arch st., Philadelphia, Pa. Price $1.50.



Barrott vaporizer

SERVICE EQUIPMENT

Aids for Time Saving & Accuracy

THE HANDY LATHE

A new screw-cutting engine lathe ranging in size from 9 inches to 13 inches swing and of the usual bed lengths. It is a general purpose machine, designed for starter and magneto maintenance stations. It can be arranged for either motor or belt drive.

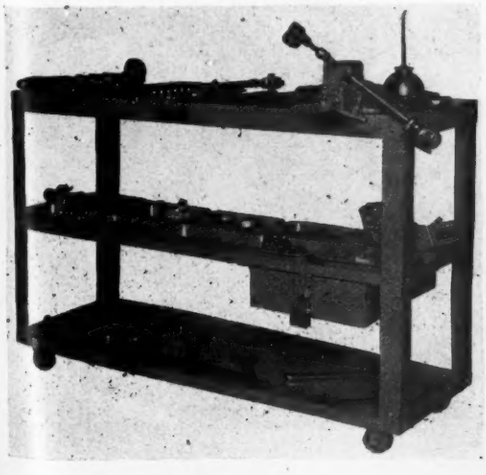
The manufacturer is also placing on the market a plain turning lathe having 10⅛ in. swing, 3 ft. bed, taking 12 in. between centers, equipped with plain rest and feeds from .002 to .040 in. per revolution of spindle, set-over tail stock, open belt, three-step cone and self-oiling spindle. The countershaft is of the tight and loose pulley type with roller bearings in loose pulley. Seneca Falls Mfg. Co., Inc., Seneca Falls, N. Y.

VAN NORMAN RELIO WET GRINDER

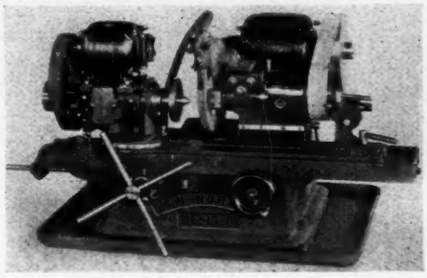
This machine is similar to the regular grinder put out by this concern except that it is made as a wet grinder and incorporates a few changes over the previous model. It has the necessary pump tank and piping for flood lubrication. The wheel head is equipped with a one-half horsepower motor and carries an 8-inch by ¾-inch wheel. This feature and the improved turning tool fitted to this model constitute the only difference in the two machines. The weight of this model is 600 lbs. and it is known as Model No. 2. Manufactured by the Van Norman Machine Tool Co., Springfield, Mass.

ALTO BATTERY TURN TABLE

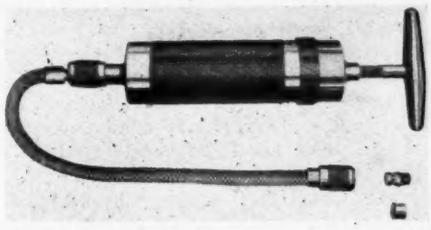
This device is constructed of two steel plates connected with ball bearings which enable the parts to turn easily when carrying as high as 500 lbs. Price $2.50. Alto Mfg. Co., 1801 Cornelia Ave., Chicago.



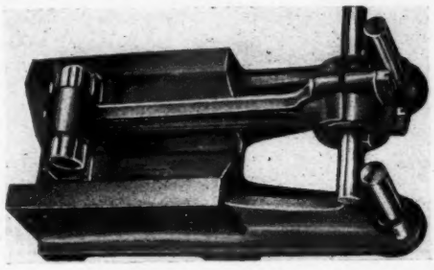
Portable shop table



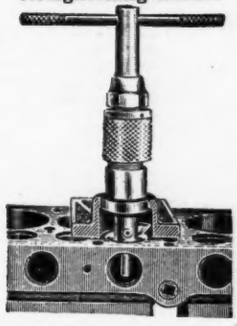
Van Norman Relio wet grinder



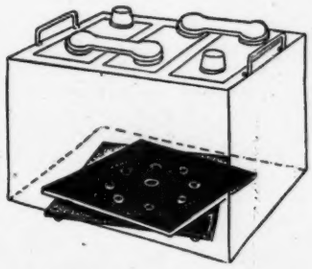
Thuro lubricator



Allen connecting rod aligning and straightening fixture



Davis valve reseating and boring tool



Alto battery turn table

DAVIS VALVE RESEATING AND BORING TOOL

This tool can be used to reseat or bore the valve ports larger. The cutters are regular lathe tools. Provision is made for pilots centering in worn guide holes. It has an attachment whereby Buick valve cages can be handled. The complete set consists of: Three boring bars with 5-16 and 7-16 in. pilots; two valve seating cutters, 45 deg. angle; one knurled handle to turn cutters; two boring cutters; one wrench for hexagon set screw; Buick valve cage holder with bushing for the smaller cages. All inclosed in mahogany finished chest. Weight 18 lbs. net. The Hinckley Machine Works, Hinckley, Ill.

PORTABLE SHOP TABLE

The portable shop table is made entirely of steel and is equipped with vise, various tool and parts trays, a box with lock and lower sill for large tools. It is supported on four casters which enable it to be wheeled to any part of the shop. Its dimensions are 30 ins. high, 46 ins. long and 16 ins. wide. It weighs 85 lbs. Auto Table Co., 121st & Jamaica Ave., Richmond Hill, N. Y.

ALLEN CONNECTING ROD ALIGNING STRAIGHENING FIXTURE

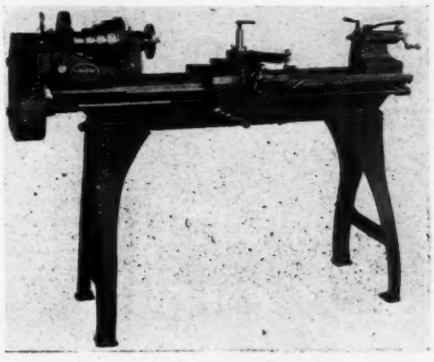
A tool for straightening and aligning connecting rods. Price $55. Allen Wrench & Tool Co., Providence, R. I.

THURO LUBRICATOR

The Thuro lubricator is of the high pressure type. Patented snap couplings attach the flexible metal hose to the compressor and the hose to the car bearing. Nipples are designed to fit every type of bearing. The Larkin Automotive Parts Co., Dayton, O.

GILBERT "C" BABBITT

The Gilbert "C" babbitt is composed chiefly of tin, nickel and copper. A. Gilbert & Sons Brass Foundry Co., St. Louis.

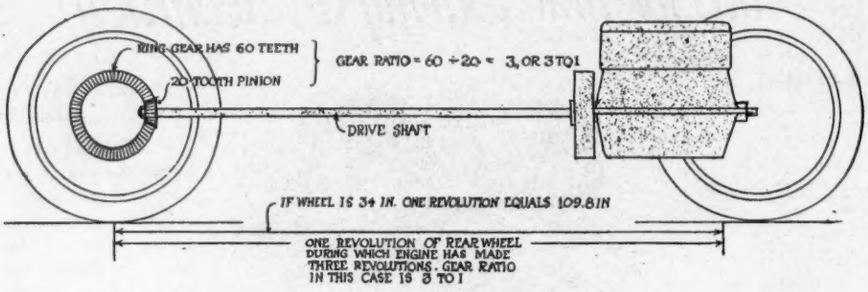


Handy lathe

REAR AXLE GEAR RATIOS of PASSENGER CARS

From 1914 *to* 1922

Motor Age Maintenance Data No. 173



What is Meant by the Term Gear Ratio

IN connection with motor car maintenance we frequently hear gear ratio discussed without a proper understanding of the technical meaning of the term. A service attendant says this or that car is geared high, when in reality he means it is geared low, or vice versa. Because a car is fast is no indication that it has a high gear ratio. Similarly a comparatively slower car is not geared "too low." We speak of a car with a 5 to 1 ratio as being geared high, while a car, a racing car, with a ratio of, say 2.5 to 1, has a low ratio. Engine speed, weight of car and the use to which the car is to be put are some of the factors which determine gear ratio. In the olden days when our engine revolutions were not as high as they are in today's engines, it was customary to use lower gear ratios in the cars. This was done to get higher road speeds. The engines in some cars today attain 3000 or 4000 r.p.m. and consequently a higher gear ratio can be used in the rear axle.

The racing cars of 1914 and 1915 used engines which were not as high speed as those used today and so, as in the case of passenger cars, we find the racing cars of several years ago with axle ratios lower than those used today.

Gear ratio is the proportion of speed in revolutions per minute between the engine and road wheels. On direct drive this is determined entirely by the gears in the rear axle. The ratio between the engine speed and the wheel is the same as that between the number of teeth in the pinion and ring gear. If there are twenty teeth on the pinion and sixty on the ring gear the ratio is 60 divided by 20, or 3 to 1.

Naturally the size of the tire will affect the gear ratio. It is possible, for example, to speed up a car slightly by fitting larger diameter tires but this may be done at the expense of acceleration or "get-away."

Some mechanics have changed engines in a car and wondered why the speed is not as high as with the former engine, if they installed an engine of greater power. Suppose you take out the engine of a car which has a maximum speed of 60 m.p.h. and you install one of greater power, but one which develops its power at a smaller number of revolutions. Then to get the same speed as that with the old engine, the rear axle gears must be lowered to maintain the ratio. For example, it might be necessary to change a ratio of 3.5 to 1 to one of 2.75 to 1.

The influence of the high speed engine will be noticed in studying the gear ratios from 1914 to 1922. It will be seen that whereas the average ratio in 1914 was about 3.75 to 1, today it is something like 4.50 to 1.

1914 Models

CAR	Model	Cyls.	Ratio
Abbott-Detroit	34-40-K	4	3.50
Abbott-Detroit	40-50-L	4	3.50
Abbott-Detroit	Belle Isle	6	4.00
Allen	40	4	4.00
American	6-44	6	3.60
Ames	45	4	3.50
Apperson	4-45	4	3.53
Apperson	6-45	6	3.53
Apperson	6-55	6	3.53
Arbenz	.....	4	3.75
Auburn	4-40	4	3.50
Auburn	6-46	6	3.50
Buick	B24	4	4.00
Buick	B55	6	3.75
Cadillac	1914	4	*2.50
Cameron	.....	4	3.00
Cartercar	7	4	3.45
Cartercar	5	4	3.60
Case	25	4	3.75
Case	35	4	3.50
Case	40	4	3.67
Chadwick	19	6	2.25
Chalmers	24	6	3.75
Chevrolet	H2	4	3.74
Chevrolet	H4	4	4.00
Cocy	A	4	3.00
Colby	6C	6	3.66
Cole	4	4	4.23
Cole	6	6	3.93
Continental	30	4	4.00
Continental	27	4	3.50
Corbitt	DEF	4	3.78
Cerriga	H	6	4.00
Crane	4	6	3.00
Croxton	ABX	4	3.50
Crow-Elkhart	G42	4	4.00
Crow-Elkhart	D52	4	4.00
Crow-Elkhart	D62	6	4.00
Cunningham	M	4	3.43
Davis	35J	4	4.00
Davis	6-50	6	3.75
Day Utility	D	4	4.00
Detroiter	A	4	4.00
Desoto	6	6	3.50
Dispatch	1914	4	4.00
Dorris	I	4	3.66
Duryea	.....	2	8.00
Empire	31	4	4.00
Enger	ABC	4	3.50
Fal	G	4	3.00
Fal	.....	4	3.50
Fiat	54	4	3.28
Fiat	55	4	2.70
Fiat	56	6	3.06
Firestone Col	86-E	4	3.50
Firestone Col	69-D	4	3.50
Firestone Col	90-E	6	3.50
Flyer	A	4	4.00
Ford	T	4	3.64
Franklin	6-30	6	3.71
Gleason	R	2	6.00
Glide	36-42	4	3.50
Grant	21	4	4.50
Great Southern	50	4	2.60
Great Western	1914	4	3.50
Great Eagle	B	4	3.39
Havre	644	6	3.75
Havre	660	6	3.75
Haynes	28	4	3.55
Haynes	26	6	3.66
Henderson	4	4	3.65
Henderson	6	6	3.50
Herreshoff	430	4	4.00
Herreshoff	640	6	4.00
Holly	A1	6	3.25
Howard	D	6	3.44
Hudson	640	6	4.00
Hudson	654	6	3.75
Hupmobile	32	4	3.86
Illinois	K14	4	4.00
Imperial	32	4	3.50
Imperial	34	4	3.50
Imperial	44-6	6	3.50
Imperial	54-6	6	3.50
Inter State	45	6	3.50
Jackson	Olym.	4	3.75
Jackson	Major	4	3.50
Jackson	Sultan	6	4.00
Jeffrey	93	4	4.08
Jeffrey	96	6	3.92
King	B	4	3.58
KisselKar	40	4	4.00
KisselKar	48	6	4.00
KisselKar	60	6	3.76
Kline Kar	430	4	4.00
Kline Kar	440	4	3.70
Kline Kar	650	6	3.70
Kline Kar	660	6	3.70
Knox	44	4	3.30
Knox	46	6	3.50
Knox	66	6	3.00
Krit	L	4	4.00
Lambert	46	4	3.60
Lambert	60	4	3.60
Lenox	4	4	....
Lenox	6	6	....
Lewis	6	6	3.75
Locomobile	38	6	3.54
Locomobile	48	6	3.54
Lozier	77	6	3.75
Luverne	760	6	3.75
Lyons-Knight	4	4	3.85
Marathon	R	4	4.00
Marathon	W	4	4.00
Marion	B	4	3.70
Marion	G	6	3.70
Marmon	32	4	3.40
Marmon	48	6	3.46
Marmon	41	6	3.60
Maxwell	25-4	4	3.58
Maxwell	35-4	4	3.53
Maxwell	50-6	6	3.69
McFarlan	T	6	3.50
Mercer	35-J	4	2.52
Mercer	35-M	4	3.00
Mercer	35-H	4	2.82
Meteor	M-36	4	3.75
Meteor	W-6-45	6	3.75
Metroprol	C	4	2.50
Metz	.....	4	....
Mitchell	4	4	3.35
Mitchell	Little Six	6	3.35
Mitchell	Big Six	6	3.35
Moline-Knight	26-50	4	4.25
Monarch	4	4	....
Mondex	Majic	6	3.66
Mondex	Majic	6	3.66
Moon	42	4	3.50
Moon	6-50	6	3.80
Morse	D	4	3.38
Moyer	E	4	3.50
Moyer	G	6	3.36
National	40	4	3.00
National	6	6	4.00
Norwalk	D	6	3.80
Norwalk	C	6	3.80
Oakland	36	4	3.50
Oakland	M-48	6	2.50
Ohio	Ohio	4	4.00
Ohio	Royal	6	3.50
Oldsmobile	E-54	6	3.80
Overland	79	4	Opt.
Packard	238	6	....
Paige	25	4	4.00
Paige	36	4	3.79
Palmer-Singer	.....	6	....
Palmer-Singer	50	6	3.75
Partin-Palmer	38	4	3.80
Paterson	33	4	4.00
Pathfinder	14	4	4.00
Pathfinder	6	6	3.77
Peerless	38-6	6	3.56
Peerless	48-6	6	3.17

Rear Axle Gear Ratios of Passenger Cars from 1914 to 1922

1914 Models
CONTINUED

CAR	Model	Cyls.	Ratio
Peerless	66	6	2.59
Pierce Arrow	.....	...	....
Pilot	50	4	3.50
Pilot	60	6	3.50
Pratt	4-50	4	4.00
Premier	6	6	3.79
Premier	6-48	6	3.79
Pullman	4-36	4	3.75
Pullman	4-44	4	3.75
Pullman	6-66	6	3.75
Rayfield	D	6	3.50
Read	30	4	4.00
Regal	TNC	4	2.23
Regal	C	4	4.08
Reo	Fifth	4	3.70
Republic	E	6	3.70
Richmond	R	4	4.00
Richmond	S	4	4.00
Richmond	T	6	Opt.
Selden	49	4	3.50
S. G. V.	F	4	4.00
Simplex	38	4	2.75
Simplex	75	4	2.13
S. & M.	14-48	6	Opt.
Stauling	4	4	3.75
Speedwell	H	6	Opt.
Spoerer	40	4	Opt.
Staver	45A	4	3.50
Staver	65A	6	3.50
Stearns-Knight	.....	4	3.90
Stearns-Knight	6	6	3.40
Studebaker	4	4	4.00
Studebaker	6	6	3.70
Stutz	.....	...	....
Torraine	12	6	3.50
Tribune	A	4	3.75
Vaughan	6	6	3.04
Velie	5	4	3.04
Velie	10	6	4.00
Velie	9	4	4.00
Vulcan	27	4	4.00
White	.....	...	....
Willys-Knight	K-17	4	4.80
Winton	20	6	3.43
Zimmerman	D	2	4.50
Zimmerman	B-6	6	3.50

1915 Models

Abbott-Detroit	34-40K	4	3.75
Abbott-Detroit	40-50L	4	3.50
Abbott-Detroit	50-60-F	6	4.00
Allen	34	4	4.00
Apperson	.....	...	....
Arbenz	.....	4	3.75
Argo	.....	4	4.25
Auburn	4-36	4	4.08
Auburn	6-40	6	4.00
Auburn	6-47	6	4.50
Austin	66	6	3.00
Bauer	4	4	4.00
Briscoe	4	4	4.00
Buick	C36	4	3.50
Buick	C54	6	3.75
Cadillac	.....	8	4.42
Cartercar	.....	4	4.00
Case	25	4	4.00
Case	35	4	3.58
Case	40	4	....
Chadwick	19	6	2.25
Chalmers	26-B	6	4.00
Chalmers	M6	6	4.00
Chandler	15	6	4.00
Chevrolet	BG	4	4.00
Cole	440	4	3.50
Cole	6	6	3.93
Cole	6-50	6	4.67
Corbitt	F	4	4.00
Crawford	635	6	3.90
Crow-Elkhart	E42	4	4.00
Crow-Elkhart	E52	4	4.00
Crow-Elkhart	E-62	6	4.00
Cunningham	S	4	3.50
Davis	38-A	4	4.00
Davis	6-50	6	3.75
Detroiter	C4	4	4.30
Dile	4	4	4.00
Dodge	4	4	3.61
Dorris	1-A-4	4	4.08
Empire	34-40	4	4.00
Enger	6-50	6	3.78
Fiat	.....	...	....
Firestone Col.	82-E	4	3.50
Firestone Col.	19	6	3.50
Ford	T	4	3.63
Franklin	6-30	6	3.70
F. R. P.	44-V	4	Opt.
Glide	30	4	4.00
Grant	N	4	4.50
Grant	T	6	4.00
Great Western	A	4	3.50
Great Western	B	4	4.00

CAR	Model	Cyls.	Ratio
Haynes	32	4	3.69
Haynes	30	6	4.00
Haynes	31	6	3.66
Herff-Brooks	4-40	4	4.00
Herff-Brooks	6-50	6	4.00
Herreshoff	4-16	4	4.00
Hudson	6-40	6	3.77
Hudson	6-54	6	3.77
Hupmobile	H	4	3.86
Hupmobile	K	4	4.25
Imperial	64	4	4.00
Imperial	56	6	3.87
Inter State	71	4	4.00
Jackson	Olym.	4	3.50
Jackson	6-48	6	4.00
Jeffrey	4	4	4.07
Jeffrey	6	6	3.50
Jeffrey	Chester.	6	4.50
Kearns	4	4	4.00
King	D	8	....
King	4	4	3.70
Kissel	4-36	4	4.00
Kissel	42	6	....
Kissel	6-48	6	4.00
Kissel	6-60	6	3.75
Kline	6-42	6	3.75
Krit	O	4	4.00
Lambert	48-C	4	....
Lenox	4	4	3.30
Lenox	6	6	3.07
Lewis	6	6	3.75
Lexington	6-L	6	4.00
Lexington	6-M	6	....
Locomobile	M-5	6	3.50
Locomobile	R-4	6	3.80
Luverne	760	6	4.00
Lyons-Knight	K-4	4	3.87
Maxwell	25	4	3.58
McFarlan	T	6	3.58
McFarlan	X	6	3.58
McIntyre	75	4	4.00
McIntyre	6-40	6	4.00
Meteor	42	4	3.70
Meteor	45	6	3.70
Metz	22	4	2.81
Mitchell-Lewis	.....	4	4.00
Mitchell-Lewis	6	6	4.00
Mitchell-Lewis	7-6	6	3.35
Mitchell-Lewis	5-6	6	3.35
Moline-Knight	4	4	....
Marmon	41	6	....
Marmon	48	6	3.46
Monarch	6	6	4.00
Moon	4-38	4	4.00
Moon	6-40	6	4.00
Morse	D-4	4	3.00
National	AA	6	4.00
Norwalk	F	6	4.08
Oakland	37	4	4.00
Oakland	49	6	4.00
Oldsmobile	42	4	4.00
Oldsmobile	55	6	4.00
Overland	80	4	3.75
Overland	81	4	3.75
Overland	82	6	4.00
Owen	6	6	3.00
Packard	3-38	6	3.93
Packard	5-48	6	3.93
Paige-Detroit	.....	6	4.07
Parkin-Palmer	20	4	4.20
Parkin-Palmer	38	4	3.75
Paterson	4-32	4	4.00
Paterson	6-48	6	3.75
Pathfinder	6	6	3.75
Peerless	54	4	4.50
Peerless	55	6	4.00
Peerless	48	6	3.25
Peter Pan	4	4	....
Pierce Arrow	38	6	3.78
Pierce Arrow	48	6	3.53
Pierce Arrow	66	6	2.88
Pilot	55	6	4.00
Pilot	75	6	3.60
Pratt	4-40	4	3.91
Pratt	6-50	6	3.93
Premier	A	6	3.87
Pullman	Jr.	4	4.00
Pullman	6-48	6	3.90
Rayfield	20	4	3.75
R-G-H	K	4	4.00
Regal	D	4	3.75
Remington	4	4	4.00
Reo	R	4	4.00
Reo	M	6	3.70
Republic	E	6	4.00
Saxon	A	4	4.40
Saxon	B	6	4.50
Scripps-Booth	C	4	4.00
S-G-V	J	4	4.00
Simplex	38	4	2.75
Simplex	50	4	2.13
Singer	6	6	3.77
Spauling	4	4	3.75
Speedwell	I	6	4.08
Sphinx	A-15	4	4.00
Stearns	4	4	4.00
Stearns	Big 4	4	3.90
Stearns	6	6	3.50
Stevens-Duryea	B6	6	3.62
Stevens-Duryea	DD-6	6	3.62
Studebaker	SD	4	4.00

CAR	Model	Cyls.	Ratio
Studebaker	6	6	3.70
Stutz	HCS	4	4.00
Stutz	40	4	3.50
Stutz	6	6	3.50
Torraine	12	6	3.50
Trumball	15A	4	3.60
Twombley	4	4	4.00
Velie	12	4	3.93
Velie	14	6	3.93
Velie	15	6	4.00
Vixen	S-B	4	....
Vulcan	35	4	4.00
Westcott	O	4	4.00
Westcott	U	6	3.77
White	30	4	3.92
White	45	4	3.40
White	60	6	3.40
Willys-Knight	K-19	4	4.83
Winton	21	6	3.92

1916 Models

Abbott	8-44	8	4.60
Abbott	6-44	6	4.58
Allen	.....	4	4.00
Apperson	8-16	8	4.25
Apperson	6-16	6	3.92
Arbenz	25	4	4.25
Argo	4	4	4.25
Auburn	6-38	6	4.42
Auburn	6-40A	6	4.00
Auburn	4-38	4	4.00
Bell	A-16	4	4.00
Biddle	D	4	4.00
Brewster	.....	4	3.92
Briscoe	8	8	4.41
Briscoe	4-38	4	4.08
Buick	D-54	6	3.77
Buick	D-44	6	3.78
Cadillac	53	8	4.50
Cameron	.....	6	3.75
Case	T	4	4.25
Chalmers	M6	6	3.75
Chalmers	48	6	4.00
Chalmers	40	6	4.50
Chandler	16	6	4.40
Chevrolet	BG	4	4.00
Chevrolet	4-90	4	3.67
Cole	8-50	8	4.47
Crow-Elkhart	30	4	4.25
Daniels	A	8	4.50
Davis	6-F	6	4.42
Davis	6-E	6	4.00
Detroiter	F	4	4.00
Dispatch	G	4	3.12
Dodge	4	4	3.61
Dorris	1-A-4	6	4.08
Dorris	1-A-6	6	4.08
Dort	5-A	4	4.10
Elkhart	.....	4	4.25
Empire	60	6	4.00
Empire	45	4	4.00
Enger Twin Six	.....	12	4.75
Farmack	.....	4	4.25
Fiat	56	6	3.06
Fiat	55	4	2.70
Ford	T	4	3.63
Franklin	8	6	4.00
F. R. P.	4	4	2.60
Glide	6-40	6	4.64
Grant	B	6	4.50
Halladay	R-2	6	4.62
Harvard	4-20	4	4.00
Haynes	34 & 35	6	4.07
Herff-Brooks	435	4	4.00
Herff-Brooks	650	6	4.00
Hudson	Super 6	6	4.45
Hupmobile	NU & N	4	4.00
Inter State	T & TR	4	4.00
Jackson	68	8	4.10
Jackson	4-38	8	4.41
Jackson	34	4	4.41
Jeffrey	C	6	4.83
Jeffrey	4	4	4.10
King	8D	8	4.64
King	8E	8	4.64
Kissel	6-42	6	3.92
Kissel	4-32	4	4.25
Kline	6-30	6	4.50
Lenox	D	4	3.25
Lenox	O	6	3.75
Lexington	6-LA	6	4.07
Lexington	4-KA	4	4.00
Locomobile	48-M6	6	3.85
Locomobile	38-R6	6	3.85
Lozier	84	4	3.93
Lozier	82	6	3.93
Luverne	7-60	6	3.75
Madison	T	6	4.64
Marion	K	6	4.33
Marmon	34	6	3.69
Maxwell	.....	4	3.58
McFarlan	6-T	6	3.07
McFarlan	X	6	3.07
Mecca	30	4	....
Mercer	22-72	4	....
Metz	25	4	....
Mitchell	.....	8	4.41

CAR	Model	Cyls.	Ratio
Mitchell	6	6	4.12
Moline-Knight	MK-50	4	4.25
Moline-Knight	40	4	4.40
Monitor	C & R	4	4.00
Monitor	N	6	4.00
Monroe	M-2	4	....
Moon	6-40	6	4.00
Moon	6-30	6	4.60
Morse	D	4	3.33
National	12	12	4.58
National	6	6	4.42
National	N6	6	4.08
Oakland	50	8	4.08
Oakland	32	6	4.25
Oakland	38	4	4.43
Oldsmobile	44	8	4.42
Oldsmobile	43	4	4.42
Overland	86	6	4.01
Overland	83	4	3.70
Owen Magnetic	.....	6	3.50
Packard	Twin Six	12	4.35
Paige	6-36	6	4.41
Paige	6-46	6	4.35
Partin-Palmer	20	4	4.00
Partin-Palmer	8-45	8	3.50
Partin-Palmer	32	4	4.00
Paterson	6-42	6	4.00
Pathfinder	1 aSalle	12	4.30
Pathfinder	8-ABC	6	4.00
Peerless	56	8	4.42
Pierce-Arrow	6-A-4	6	Opt.
Pierce-Arrow	48-P-4	6	Opt.
Pierce-Arrow	38-C-4	6	Opt.
Pilot	6-75	6	3.66
Pilot	6-55	6	4.00
Pilot	6-45	6	4.50
Premier	6-56	6	4.08
Pullman	6-48	6	....
Pullman	4	4	4.25
Regal	E	4	4.25
Regal	D	4	4.00
Regal	F	8	4.00
Reo	R	4	4.00
Reo	M	6	4.00
Republic	E	6	4.00
Ross	8C	8	....
Ross	8A	8	4.45
Saxon	17	6	4.75
Saxon	14-15	4	4.75
Scripps-Booth	C	4	4.70
Scripps-Booth	D	8	4.70
Simplex	50	4	2.13
Simplex	46	6	3.00
Simplex	50	4	2.75
Singer	6	6	3.50
Spauling	H	4	3.75
Standard	8	8	4.45
Standard	6	6	4.00
Stearns-Knight	4	4	4.50
Stearns-Knight	6	6	3.40
Stearns-Knight	8	8	4.75
Sterling	.....	4	3.80
Stewart	T	6	4.75
Studebaker	4-40	4	4.00
Studebaker	6-50	6	3.70
Stutz	C	4	3.50
Stutz	C	4	3.06
Sun	.....	6	....
Trumball	16-B	4	3.60
Velie	15	6	4.08
Velie	22	6	4.25
Vixen	3-P	...	....
Wayne	Rich.	6	4.00
Wayne	Rich.	4	4.00
Westcott	51	6	4.45
Westcott	41	6	4.45
White	4	4	....
Willys-Knight	84	4	4.00
Winton	22	6	4.08
Winton	22A	6	4.45
Woods Mobile	F	4	4.00

1917 Models

Abbott	6-44	6	4.75
Alland	1460	4	4.33
Allen	Classic	4	4.00
American A	A	6	4.42
Ams-Stering	4	4	4.25
Anderson	6-40	4	4.42
Apperson	617	6	4.25
Apperson	817	8	4.64
Arbenz	25	4	4.25
Auburn	639	6	4.42
Auburn	644	6	4.00
Austin	HK	12	3.75
Bell	17	4	4.25
Biddle	D	4	4.00
Bour-Davis	.....	6	4.42
Brewster-Knight	.....	4	4.50
Briscoe	BA-24	4	4.23
Buick	B34	4	4.08
Buick	B44	6	4.08
Cadillac	55	8	4.37
Cameron	.....	6	4.00
Case	T-17	4	4.40
Chalmers	6-30	6	4.75
Chalmers	6-30	6	5.18
Chandler	17	6	3.40

Rear Axle Gear Ratios of Passenger Cars from 1914 to 1922

1917 Models
CONTINUED

CAR	Model	Cyls.	Ratio
Charter Oak	A	6	3.77
Chevrolet	490	4	3.67
Chevrolet	F5	4	4.25
Chevrolet	D	8	4.25
Cole	8-60	8	4.45
Crow-Elkhart	C-35	4	4.25
Cunningham	B	8	4.08
Daniels	AA	8	4.42
Davis	Light Six	6	4.42
Davis	Big Six	6	4.42
Detroiter	6-45	6	4.75
Dispatch	G	4	4.00
Dixie Flyer	.....	4	4.75
Dodge	.....	4	3.50
Dorris	1-B-6	6	4.08
Dort	9	4	4.07
Drexel	R-30-35	4	4.25
Drexel	.....	4	4.42
Drummond	D-17	8	4.42
Elcar	DEF	4	4.08
Elgin	.....	6	4.50
Emerson	.....	4	4.25
Empire	45	4	4.00
Empire	60-R	6	4.42
Empire	70	6	4.58
Enger	TUT	12	4.75
Fiat	55-E-17	4	2.75
Ford	T	4	3.63
Franklin	9	6	3.92
F. R. P.	45-A	4	2.25
F. R. P.	45-B	4	3.00
Geneva	.....	6	3.77
Glide	640	6	4.64
Grant	K	6	4.50
Hackett	4	4	4.00
Hall	21A	12	4.64
Harroun	A-1	4	4.00
Hatfield	H	4	4.25
Harvard	2-T	4	4.00
Haynes	36	6	4.42
Haynes	40	12	4.42
Hollier	186	6	4.50
Hollier	178	8	4.50
Homer-Loughlin	D	8	....
Howard	.....	6	4.75
Hudson Super Six	.....	6	4.45
Hupmobile	NR	4	4.64
Inter State	T	4	4.00
Jackson	W	8	4.75
Jeffrey	472	4	4.50
Jeffrey	671	6	4.50
Jones	26-B	6	5.00
Jordan	60	6	4.47
Kent	A	4	4.08
King	E	8	4.60
Kissel	642	6	4.58
Kissel	HP	6	4.58
Kline	6-38F	6	4.50
Lambert	90	4	....
Lambert	80	6	....
Laurel	35	4	4.25
Lexington	6-0-17	6	4.75
Lexington	6-P	6	4.08
Liberty	10-A	6	4.75
Locomobile	38	6	3.85
Locomobile	48	6	3.85
Luverne	17	6	4.00
Madison	4	6	4.64
Maibohm	A	4	4.00
Majestic	M	8	....
Majestic	A	8	....
Marion-Handley	A	6	4.42
Marion-Handley	B	6	4.08
Marmon	34	6	3.69
Maxwell	25	4	3.58
McFarlan	.....	6	3.50
Mercer	22-73	4	3.22
Mercer	22-73	4	3.87
Metz	25	4	4.00
Mitchell	D-40	6	4.41
Mitchell	C-42	6	4.41
Moline-Knight	MK-40	4	4.30
Moline-Knight	MK-50	4	4.00
Monitor	C & R	4	4.00
Monitor	N & O	6	4.00
Monroe	N-3	4	4.25
Monroe	M-4	4	4.75
Moon	6-43	6	4.75
Moon	6-66	6	4.42
Moore	35	4	3.70
Murray	70-T	8	4.47
Napoleon	30	4	4.00
National	6	6	4.58
National	12	12	5.00
Oakland	34	6	4.50
Oakland	50	8	4.08
Ogren	102	6	3.75
Oldsmobile	45	8	4.92
Overland	90	4	3.75
Overland	85	4	4.00
Overland	85	6	4.60
Owen Magnetic	M-25	6	4.50
Owen Magnetic	4-36	6	3.50
Packard	2-25	12	4.36
Paige	638	6	4.41
Paige	646	6	4.35
Partin-Palmer	24	4	4.00
Partin-Palmer	32	4	4.00
Paterson	6-45	6	4.50
Pathfinder	2B	12	4.33
Pathfinder	3B	12	4.33
Peerless	56	8	4.45
Phianna	M	4	4.00
Pierce-Arrow	38	6	3.78
Pierce-Arrow	48	6	3.53
Pierce-Arrow	66	6	2.88
Pilot	6-45	6	4.75
Premier	6-B	6	4.45
Princess	4-36-F	4	4.25
Pullman	424	4	4.50
Regal	J	4	4.25
Regal	F	8	4.00
Reo	R	4	4.30
Reo	N	6	4.30
Richmond	617	6	4.25
Roamer	.....	6	4.42
Ross	C	8	4.64
Saxon	B-5	4	5.00
Saxon	S-4	6	4.75
Scripps-Booth	D	8	4.80
Simplex	6	6	....
Singer	17	6	3.77
Standard	E	8	4.45
Standard	F	8	4.45
Stearns-Knight	4	4	4.50
Stearns-Knight	4	8	4.75
Stephens	6-65	6	4.75
Studebaker	4	4	4.00
Studebaker	6	6	3.70
Stutz	R	4	3.06
Sun	17	6	4.75
Templar	445	4	4.45
Templar	645	6	4.45
Velie	28	6	4.33
Velie	27	6	4.08
Westcott	S17	6	4.45
White	16	4	....
Willys-Knight	88-4	4	4.30
Willys-Knight	88-8	8	4.60
Willys	88-6	6	4.00
Winton	33	6	4.45
Winton	48	6	4.08
Woods	1600	4	8.25
Yale	.....	8	4.45

1918 Models

CAR	Model	Cyls.	Ratio
Abbott	6-62	6	4.30
Allen	41	4	4.25
American	D	6	4.42
Anderson	20	6	4.58
Apperson	.....	6	4.25
Apperson	.....	8	4.25
Arbenz	25	4	4.25
Auburn	6-39	6	4.42
Auburn	6-44	6	4.08
Austin	.....	12	3.75
Austin	.....	12	5.25
Biddle	H	4	4.40
Bour-Davis	18A	4	4.00
Bour-Davis	18B	6	4.07
Brewster	1	4	4.50
Briscoe	4-24	4	4.25
Buick	34 & 35	4	4.08
Buick	44-46	6	4.08
Buick	50 & 49	6	4.61
Cadillac	57	8	4.43
Cadillac	57	8	5.07
Campbell	.....	4	4.25
Case	U	6	4.45
Chalmers	.....	6	4.75
Chalmers	.....	6	5.09
Chandler	25	6	4.40
Chevrolet	490	4	3.65
Chevrolet	4	4	4.25
Chevrolet	D4	8	4.25
Cole	870	8	4.45
Columbia	C & E	6	4.75
Comet	C-50	6	4.50
Commonwealth	4-40	4	4.00
Crawford	4-40	6	4.08
Crow-Elkhart	CE-36	4	4.25
Cunningham	8	8	3.08
Cunningham	8	8	4.08
Daniels	B	8	4.45
Davis	H, I & K	6	4.58
Davis	J & JI	6	4.42
Disbrow	A	4	2.91
Dispatch	G	4	4.12
Dodge	.....	4	4.17
Dodge	.....	4	3.62
Dorris	1C	6	3.50
Dort	11	4	4.00
Elcar	4	4	4.50
Elcar	6	6	4.50
Elgin	A	6	4.45
Empire	50-51	4	4.33
Empire	50-51	4	4.75
Empire	70A	6	4.58
Empire	71	6	4.00
Empire	73	6	4.58
Fageol	.....	6	1.50
Fergus	.....	6	4.00
Fergus	.....	6	4.75
Fiat	E-17	4	2.75
Ford	T	4	3.64
Franklin	9	6	4.33
F. R. P.	45B	4	3.00
Geromine	.....	4	4.00
Geromine	4-45	6	4.50
Ghent	4-60	6	4.33
Glide	6-40	6	4.64
Grant	G	6	4.50
Hackett	AL	4	4.00
Hall	21-A	12	4.45
Harroun	.....	4	4.00
Harvard	4-20	4	4.00
Haynes	38	6	4.42
Haynes	39	6	4.42
Haynes	44	12	4.07
Hollier	196	6	4.50
Hollier	206	6	4.50
Hollier	188	8	4.50
Homer-Loughlin	D	8	....
Hudson	.....	6	4.08
Hupmobile	R	4	4.91
Inter State	T	4	4.00
Jackson	.....	8	5.27
Jones	26-AB	6	4.45
Jordan	J-60	6	4.45
King	AA	8	4.58
Kissel	.....	6	4.58
Kissel	.....	12	4.58
Kline	6-38	6	4.33
Lexington	R	6	5.00
Liberty	10-D	6	4.75
Locomobile	38	6	3.85
Locomobile	48	6	3.85
Madison	6	6	4.42
Maibohm	A	4	4.25
Maibohm	B	6	4.25
Marion-Handley	A	6	4.41
Marion-Handley	B	6	4.07
Marmon	34	6	3.69
Maxwell	25	4	3.58
McFarlan	X	6	3.50
Mercer	.....	4	3.22
Mercer	.....	4	3.87
Metz	25	4	....
Mitchell	D-40	6	4.25
Mitchell	C-42	6	4.25
Moline-Knight	C	4	4.90
Moline-Knight	G	4	4.00
Monitor	.....	6	4.08
Monitor	.....	6	4.50
Monroe	M-3	4	4.00
Monroe	M-6	4	4.80
Moon	6-36	6	4.75
Moon	6-45	6	4.75
Moon	6-66	6	4.45
Moore	30-E	4	4.25
Moore	30	4	4.25
Murray	.....	8	4.45
Murray	.....	8	4.08
Nash	681	6	4.50
Nash	671	6	4.50
Nash	684	6	4.50
National	.....	6	4.58
National	.....	12	4.58
Nelson	.....	4	4.25
Oakland	34B	6	4.50
Oldsmobile	37	6	4.58
Oldsmobile	45A	8	4.92
Olympian	.....	4	4.75
Overland	85	4	4.00
Overland	90	4	4.00
Overland	85	6	4.60
Owen Magnetic	W-42	6	4.00
Packard	3-25	12	4.36
Paige	6-39	6	4.42
Paige	6-55	6	4.36
Pan-American	G-5	6	4.45
Pan-American	J-7	6	3.70
Paterson	6-45	6	4.50
Peerless	56	8	4.90
Pennsy	.....	4	4.00
Pennsy	.....	8	4.58
Phianna	N	4	4.00
Pierce-Arrow	C-4	6	3.78
Pierce-Arrow	B-4	6	3.53
Pierce-Arrow	A-4	6	2.88
Pilot	6-44	6	4.25
Premier	6-C	6	4.45
Princess	36-F	4	4.25
Regal	J	4	4.25
Reo	R	4	4.30
Reo	M	6	4.30
Roamer	D75	4	3.77
Roamer	C54	6	3.77
Roamer	D90	6	3.50
Saxon	E-5	4	5.00
Saxon	F-4	6	4.75
Sayers	.....	6	4.75
Scripps-Booth	B	4	3.69
Scripps-Booth	B	4	4.07
Scripps-Booth	H	8	4.80
Scripps-Booth	H	8	5.33
Seneca	O	4	4.50
Shad-Wick	A & B	6	4.45
Simplex	B	6	3.00
Singer	.....	6	3.70
Standard	G	8	4.45
States	C	6	4.00
Stearns	SKL	4	4.50
Stearns	SK	8	4.75
Stephens	.....	6	4.75
Studebaker	SH	4	4.08
Studebaker	EH	6	4.00
Studebaker	EG	6	3.71
Stutz	S	4	3.50
Templar	445	4	4.81
Tulsa	D4	4	4.50
Velie	38	6	4.75
Velie	39	6	4.45
Westcott	.....	6	4.45
White	.....	4	....
Willys	89	6	4.00
Willys-Knight	88	4	4.30
Willys-Knight	88	8	4.60
Winton	33	6	4.45
Winton	48	6	4.45
Winton	48	6	4.08
Wolverine	4	4	2.94
Wolverine	4	4	4.00
Woods	G-E	4	8.25
Yale	M	8	4.50

1919 Models

CAR	Model	Cyls.	Ratio
Allen	41	4	4 45
American	B	6	4.42
Anderson	400-G	6	3.53
Anderson	400-A-E	6	4.58
Apperson	8-18	8	4.25
Auburn	6-39	6	4.42
Biddle	H	4	4.41
Briscoe	B4-24	4	4.23
Buick	H	6	4.07
Cadillac	57	8	4.44
Cadillac	57	8	5.07
Case	U	6	4.45
Chalmers	6-30	6	4.75
Chandler	.....	6	4.40
Chevrolet	FA	4	4.25
Chevrolet	490	4	3.65
Chevrolet	D	8	4.25
Cole	870	8	4.45
Columbia	CD	6	4.75
Comet	C-51	6	4.50
Crow-Elkhart	K36	4	4.00
Cunningham	V-3	8	4.00
Daniels	D	8	4.08
Dixie	L-35	4	4.75
Dodge Bros.	4	4	4.17
Dorris	6-80	6	4.08
Dort	15	4	4.07
Elcar	4	4	4.50
Elcar	6	6	4.50
Elgin	8	6	5.00
Essex	A	4	4.66
Ford	T	4	3.64
Franklin	6	6	4.33
Harroun	A-1	4	4.00
Haynes	45	6	4.42
Haynes	46	12	4.07
Hollier	198	8	4.50
Hollier	206	6	4.50
Holmes	.....	6	4.50
Hudson	M	6	Opt.
Hupmobile	R	4	4.91
Jackson	.....	8	5.27
Jones	28	6	4.45
Jordan	.....	6	4.08
King	F	8	5.00
Kissel	.....	6	4.58
Kline	6-42-8	6	4.50
Lexington	R-19	6	5.00
Liberty	10-D	6	4.75
Locomobile	38-2	6	4.07
Locomobile	11-48	6	....
Maibohm	B	6	4.50
Marmon	34	6	3.69
Marmon	34	6	4.00
Maxwell	25	4	3.58
McFarlan	.....	6	3.50
Mercer	4	4	3.62
Mitchell	C-42	6	4.41
Mitchell	B-40	6	4.41
Moline-Knight	G	4	4.12
Moline-Knight	L	4	4.96
Monitor	M & O	6	4.00
Moon	6-36-19	6	4.75
Moon	6-66-19	6	4.60
Monroe	30-C	4	4.25
Nash	681-5	6	4.50
National	AF3	6	4.58
National	AK	12	4.58
Oakland	34-B	6	4.50
Oldsmobile	37A	6	4.58
Oldsmobile	45A	8	4.61
Oldsmobile	45A	8	4.91
Olympian	45	4	4.64
Overland	90	4	3.93
Owen Magnetic	W-42	6	4.00
Packard	325	12	4.36
Paige	655	6	4.36
Paige	640	6	4.42
Paterson	648	6	4.50
Peerless	56	8	4.90
Pierce-Arrow	48-E5	6	....
Pilot	6-45	6	4.25
Premier	6-C	6	4.45
Reo	T & U	4	4.30
Reo	T & U	4	6.40

Rear Axle Gear Ratios of Passenger Cars from 1914 to 1922

1919 Models
CONTINUED

CAR	Model	Cyls.	Ratio
Revere	.....	4	3.50
Roamer	654	6	3.77
Saxon	Y-18	6	5.00
Scripps-Booth	639	6	4.50
Seneca	H	4	4.50
Singer	19	6	3.70
Standard	G	8	4.90
Standard	G	8	4.45
Stearns	SKL4	4	4.50
Stephens	74-76	6	4.75
Studebaker	EG	6	3.70
Studebaker	EH	6	4.00
Studebaker	LH	4	4.08
Stutz	G	4	....
Templar	445	4	4.40
Tulsa	D	4	4.50
Velie	38	6	4.75
Velie	39	6	4.45
Velie	39	6	4.08
Westcott	18-A	6	4.45
Willys-Knight	88-4	4	4.30
Winton	22	6	4.08
Winton	22-A	6	4.73

1920 Models

Allen	43	4	4.63
American Beauty	.....	6	4.90
Anderson	30	6	4.50
Anderson	8-20	8	4.25
Apperson	Anniv.	8	4.25
Auburn	6-39	6	4.66
Biddle	B-1	4	4.50
Bour-Davis	20	6	4.75
Brewster	.....	4	4.50
Briscoe	4-34	4	4.18
Buick	45	6	4.00
Buick	49	6	4.00
Cadillac	57	8	4.44
Case	B6	6	4.45
Chalmers	.....	6	4.75
Chalmers	.....	6	5.18
Champion	4	4	4.25
Chandler	.....	6	4.40
Chevrolet	490	4	3.63
Chevrolet	FB	4	4.62
Cleveland	40	6	4.45
Cole	870	8	4.45
Columbia	.....	6	4.75
Comet	6	6	4.66
Commonwealth	.....	4	4.25
Crow-Elkhart	L-53-6	4	4.25
Crow-Elkhart	8-53-6	6	4.25
Cunningham	V-3	8	4.08
Daniels	D-19	8	4.40
Davis	51	6	4.75
Dixie	H-S50	4	4.75
Dodge Bros	.....	4	4.16
Dorris	680	6	3.50
Dort	15	4	4.07
Economy	6-46	6	4.50
Elcar	.....	6	4.50
Elcar	.....	4	4.50
Elgin	.....	6	5.09
Essex	A	4	5.09
Ford	T	4	3.63
Franklin	9	6	4.33
Grant	XH	6	4.63
Hackett	.....	4	4.75
Harroun	A-2	4	4.00
Haynes	45	6	4.42
Haynes	46	12	4.07
Hollier	206-B	6	4.41
Holmes	.....	6	4.90
Hudson	.....	6	4.45
Hupmobile	R-3	4	4.87
Jones	29	6	4.50
Jordon	M	6	4.66
Jordan	F	6	4.08
King	H	8	4.08
Kissel	45	6	3.62
Kline	655-J	6	4.50
Lexington	S	6	4.56
Liberty	10-C	6	4.66
Locomobile	48	6	3.50
Maibohm	B	6	4.50
Marmon	34	6	3.75
Maxwell	25	4	....
McFarlan	127	6	3.58
Mercer	5	4	3.22
Meteor	.....	4	4.41
Metz	.....	6	4.63
Mitchell	F-40	6	4.41
Moline-Knight	R	4	4.75
Moline-Knight	J	6	4.90
Monroe	.....	4	4.50
Moon	Victory	6	4.75
Moon	6-68	6	4.45
Nash	681-7	6	4.50
National Sextet	.....	6	4.08
Nelson	B	4	4.25
Noma	1-B	6	....
Oakland	34-C	6	4.50
Oldsmobile	37-A	6	4.58
Oldsmobile	45-B	8	4.91
Overland	4	4	4.50
Packard	335	12	4.36
Paige	6-42	6	4.50
Paige	6-55	6	4.33
Paterson	6-47	6	4.50
Peerless	56	8	4.54
Piedmont	6-40	6	4.45
Piedmont	4	4	4.45
Pierce-Arrow	31	6	3.78
Pierce-Arrow	51	6	3.58
Pilot	645	6	4.90
Porter	45	4	3.00
Premier	6-D	6	4.50
Reo	T-6	6	4.66
Revere	C	4	3.44
Roamer	6-54	6	....
Scripps-Booth	B	6	4.50
Seneca	L	4	4.50
Singer	20	12	3.77
Spacke	S-20	2	5.09
Standard	I	8	4.45
Stearns	SKL4	4	4.50
Stephens	80	6	4.75
Studebaker	EJ	6	4.55
Studebaker	EH	6	4.33
Studebaker	EG	6	3.70
Stutz	H	4	3.50
Templar	445	4	4.40
Tulsa	E	4	4.50
Velie	34	6	4.60
Velie	48	6	4.66
Westcott	C-38	6	5.09
Westcott	C-48	6	4.45
Winton	25	6	4.90

1921 Models

Ace	G	6	4.56
Allen	43	4	4.63
Ambassador	R	12	4.45
American	C	6	4.50
Anderson	S-40	6	4.50
Apperson	8-21	8	4.25
Auburn	6-39	6	4.75
Beggs	20-T	6	3.75
Bour-Davis	215	6	4.50
Brewster	91	4	4.25
Briscoe	4-34	4	4.18
Buick	1921	6	4.08
Cadillac	59	8	4.43
Case	V	6	4.87
Chalmers	6-30	6	4.75
Chalmers	6-30	6	5.18
Champion	T & S	4	....
Chandler	.....	6	4.40
Chevrolet	490	4	....
Chevrolet	FB	4	....
Cleveland	40	6	4.45
Climber	S-6	6	4.75
Cole	870	8	4.45
Columbia Six	DC	6	5.10
Comet	.....	6	6.66
Commonwealth	14	4	4.25
Crawford	21-6-40	6	4.45
Crow-Elkhart	L53-56	4	4.25
Crow-Elkhart	H-53-56	6	4.25
Cunningham	V-4	8	4.08
Daniels	D19	8	3.50
Davis	51	6	5.90
Dodge Bros	.....	4	4.16
Dort	17-A	4	4.07
Dixie Flyer	H-S-70	4	4.72
Dorris	680	6	3.35
DuPont	A	4	4.45
Elcar	7-R	6	4.50
Elgin Six	K	6	5.10
Essex	A	4	4.66
Friend	4	4	4.60
Ferris	.....	6	4.08
Franklin	9-B	6	4.33
Ford	T	4	3.63
Gardner	G	4	4.41
Grant	HX	6	4.66
Globe	B-10	4	4.90
Hanson	60	6	4.66
Harroun	A-A-2	4	4.00
Halladay	21	6	....
Hatfield	A-42	4	4.63
Haynes	47	6	4.77
H. C. S.	Series 3	4	....
Holmes	Series 4	6	4.90
Hudson Super 6	O	6	4.90
Hupmobile	R	4	4.87
Jackson	638	6	4.75
Jordan	M	6	4.66
Kenworthy	890	8	4.08
Kissel	.....	6	4.87
King	H	8	4.25
Kline Kar	6-55-K	6	4.56
LaFayette	134	8	4.50
Leach	6	6	4.50
Lexington	S	6	4.62
Lexington	T	6	4.62
Liberty	.....	6	....
Locomobile	48	6	3.87
Lorraine	21-T	4	4.63
Lincoln	.....	8	4.45
Maibohm	B	6	4.50
Meteor	R & R R	4	3.92
Marmon	34	6	3.75
Maxwell	25	4	....
McFarlan	1921	6	3.50
Mercer	5	4	3.22
Merit	B	6	5.10
Metz	6	6	4.67
Mitchell	.....	6	4.41
Moon	6-48-21	6	4.66
Nash	681	6	4.50
Nash	4	4	4.50
National Sextet	BB-6	6	4.08
Northway	.....	6	4.10
Oakland	34-C	6	4.50
Oldsmobile	43-A	4	4.66
Overland	4	4	4.50
Packard Single	6	6	4.30
Packard Twin	6	12	4.36
Paige	6-42	6	4.75
Paige	6-66	6	4.55
Paterson	650	6	4.50
Peerless	.....	8	4.90
Piedmont	4-30	4	4.50
Piedmont	6-40	6	4.50
Pierce-Arrow	.....	6	4.28
Pan	A	4	4.90
Pan-American	E-6-55	6	4.90
Pilot	6-50	6	4.50
Porter	46	4	3.25
Premier	6-E	6	4.50
Premocar	6-40-A	6	....
Raleigh	.....	6	4.90
Ranger	.....	4	4.60
Reo	T-6	6	4.66
Roamer	6-54-D	6	3.87
Rock Falls	14000	6	4.87
R & V Knight	J	6	4.90
R & V Knight	R	4	4.75
Saxon	125	4	4.75
Sayer Six	DP	6	4.75
Scripps-Booth	B-39	6	4.87
Seneca	.....	4	4.75
Skelton	35	4	4.25
Standard	I	8	4.45
Standwood	Six	6	....
Stearns-Knight	SKL4	4	4.50
Stephens	90	6	4.90
Stevens-Duryea	E	6	3.94
Studebaker	Big Six	6	3.71
Studebaker	Special 6	6	4.33
Studebaker	Light 6	6	4.55
Stutz	K & H	4	3.50
Templar	445	4	4.40
Tulsa	.....	4	4.50
Velie	34	6	4.63
Velie	48	6	4.60
Westcott	C-38	6	5.09
Westcott	C-48	6	4.45
Willys-Knight	20	4	5.00
Winton	25	6	4.90
Wasp	.....	4	3.70

1922 Models

Ambassador	R	6	4.45
American	C	6	4.50
Anderson	40	6	4.50
Apperson	8	8	4.25
Auburn	651	6	5.00
Beggs	20T	6	4.75
Biddle	B1 & B5	4	4.50
Brewster	02	4	....
Buick 4	22-34-7	4	4.66
Buick 6	22-44-7	6	4.60
Buick 6	22-48-50	6	4.90
Cadillac	61	8	....
Case	X	6	4.66
Chalmers	6-30	6	5.12
Chalmers	6-30	6	5.12
Champion	S & T	4	....
Chandler	6	6	4.40
Chevrolet	490	4	3.66
Chevrolet	FB	4	....
Cleveland	40	6	4.45
Climber Four	K	4	4.00
Climber Six	S	6	4.75
Cole	890	8	....
Columbia	CC	6	....
Comet	6-53-2	6	....
Crawford	22-6-49	6	....
Crow-Elkhart	L	4	4.25
Crow-Elkhart	S	6	4.25
Cunningham	V-4	8	4.22
Daniels	D-19	8	....
Davis	61-67	6	5.99
Dixie Flyer	H4	4	4.75
Dodge Bros	.....	4	4.16
Dorris	6-80	6	....
Dort	19	4	4.45
Driggs	1922	4	4.75
Duesenberg	8	8	4.60
DuPont	A	4	....
Durant Four	A-22	4	4.30
Durant Six	B-22	6	....
Earl	40	4	3.66
Elcar	K-4	4	4.75
Elcar	7-R	6	4.50
Elgin	K-1	6	....
Essex	.....	4	4.66
Falcon Four	.....	4	4.88
Falcon Six	.....	6	4.88
Falcon	12-D-22	4	....
Ferris	60	6	....
Ferris	70	6	....
Ford	T	4	3.63
Fox	.....	6	....
Franklin	9-B	6	4.33
Frontenac	.....	4	
Gardner	RTS	4	4.44
Grant	.....	6	4.60
Goodspeed	.....	4	4.00
H. C. S.	Series 3	4	....
Handley-Knight	B	4	4.90
Hanson	60	6	4.66
Hatfield	A-42	4	4.63
Haynes	55	6	4.11
Haynes	75	6	4.60
Holmes	Series 4	6	....
Hudson	Super Six	6	4.81
Hupmobile	R	4	4.87
Jackson	6-38	6	4.75
Jordan	MK	6	4.42
Jordan	F	6	4.80
King	K	8	....
Kissel	45	6	....
Kline Kar	6-55-K	6	4.75
Kurtz Automatic	A	6	4.50
LaFayette	134	8	....
Leach	999	6	....
Lexington	T	6	5.10
Lexington	ST	6	5.10
Liberty	10D	6	4.66
Lincoln	.....	8	....
Locomobile	48	6	....
Maibohm	B	6	5.00
Marmon	34	6	....
Maxwell	.....	4	4.56
McFarlan	TV	6	3.50
Mercer	Series 5	4	3.87
Merit	BC	6	4.60
Meteor	22-80	4	....
Mitchell	F-50	6	4.42
Monroe	S-9-12	4	5.30
Moon	6-48	6	4.66
Moon	6-75	6	4.45
Murray-Mac	70-T	6	4.80
Nash	681-7	6	4.50
Nash	682	6	4.50
Nash	41-4	4	4.50
National	Series BB	6	4.08
Noma	3-C	6	....
Norwalk	4-30 KS	4	5.00
Oakland	6-44	6	4.66
Ogren	6	6	4.00
Oldsmobile	43-A	4	4.93
Oldsmobile	46	8	4.93
Oldsmobile	47	8	5.10
Overland	4	4	4.50
Packard	Single Six	6	4.30
Packard	Twin Six	12	4.36
Paige	4-44	6	4.75
Paige	6-66	6	4.55
Pan American	6-55	6	4.90
Paterson	22-6-52	6	4.50
Peerless	56	8	4.90
Piedmont	430	4	....
Piedmont	640	6	4.25
Pierce-Arrow	33	6	....
Pilot	6-50	6	5.00
Porter	46	4	3.25
Premier	6-D	6	....
Premocar	6-40	6	....
Ranger	A-22-4	4	....
Ranger	A-22-6	6	....
R. & V. Knight	R	4	4.70
R. & V. Knight	J	6	4.90
Reo	6-T-V	6	4.70
Revere	.....	4	3.49
Rickenbacker	A	6	4.63
Roamer	4-75-E	4	3.77
Roamer	6-54-E	4	4.80
Rock Falls	14000	6	4.90
Rolls-Royce	.....	6	3.25
Romer	A-22	6	4.67
Saxon	125-G	4	4.75
Sayers Six	.....	6	4.75
Seneca	50	4	4.75
Standard	8-11	8	4.45
Stanwood	A-22	6	4.50
Stearns-Knight	SKL 4	4	4.50
Stephens	90	6	....
Stevens-Duryea	E	6	3.94
Studebaker	Light Six	6	....
Studebaker	Spec. Six	6	....
Studebaker	Big	6	....
Stutz	K	4	....
Templar	445	4	4.40
Tulsa	E-1-3	4	4.50
Velie	58	6	4.66
Velie	48	6	4.60
Velie	34	6	4.63
Vogue	6-55	6	4.50
Vogue	6-66	6	4.50
Westcott	A-44	6	4.66
Westcott	C-48	6	4.45
Wills-Sainte-Claire	A68	8	....
Willys-Knight	20	4	5.00
Winther	Six 61	6	4.45
Winton Six	25	6	....

Government Inquiry Shows Motor Transportation a Vital Economic Factor

Advance Report, After Comprehensive Statistical Survey, Cites Need of Uniform Legislation by States and Advantages of Good Roads

TWO committees, one headed by Windsor T. White and the other by Roy C. Chapin and H. S. Firestone, represented the industry in the compilation of highway and transportation data by the Joint Commission of Agricultural Inquiry.

The report was submitted to Chairman Anderson on Feb. 27 and contained data on all phases of motor transports and transportation. The report is almost exclusively statistical findings of facts and few conclusions are mentioned to avoid controversy. The full report will not be ready for publication until later in May. A part of the commission's conclusions dealing with motor transportation and electric roads is printed here.

Motor transportation, according to Chairman Sydney Anderson, will figure conspicuously in the report to be made to Congress by the Joint Commission of Agricultural Inquiry.

Economies Effected by Motor Transportation

"Nothing since the advent of the railroads," he said, "has had so marked an economic and sociological effect upon the production life of the country as the motor vehicle. The commission will recommend that Congress continue to promote an adequate program of highway construction and maintenance, directed to the more effective correlation of highway transportation with rail and water transportation.

"Also that the program of highway construction and maintenance by States and counties be continued under the direction of qualified experts, with particular reference to the construction and maintenance of farm-to-market roads; that adequate funds be appropriated for research and regulation of traffic based upon the facts so ascertained.

"Also that the several States cooperate in effecting a uniform basis for taxing motor trucks and other motor vehicles, which shall fairly represent the proportion of expense of highway construction and maintenance chargeable to such vehicles."

Previous to its appearance, the economic zone of transportation was sharply defined by the haulage range of the horse and the cost of such transportation. It will be shown in the report that in 1918 the estimated cost of hauling in wagons from farms to shipping point averaged about 30c per ton mile for wheat, 33c for corn and 48c for cotton. Hauling in motor truck or by tractors the averages are 15c for wheat and corn and 18c for cotton. In the same year wagon hauling averaged 9 miles from farm to shipping point and motor truck hauls 11.3 miles; the motor truck averaged 3.4 round trips per day over its longer route, while wagons made 1.2 round trips per day.

"It thus appears," said the Chairman, "that the major result accomplished by this new form of transportation has been to extend and broaden the markets of the farmer. Single reactions are to be found in the fact that the use of the motor vehicle has brought the farmer closer to the city and also has increased the desirability and comfort of farm life."

Figures in the report will show that while the motor vehicle traffic has increased more than 1,900 per cent in the period 1910 to 1921, the actual expenditures for highway construction and maintenance, taking into consideration the increase in cost of materials and labor during the war and the readjustment period, was only slightly over 200 per cent."

In some sections the combination of inbound farm products and outbound supplies by motor truck has concentrated upon the motor truck service, the majority of the traffic within 30, 40, and 50 miles, and the commission believes that the effect upon rail carriers has been to reduce the amount of local way freight, and that ultimately it will reduce the number of local freight trains operated.

Increase in Motor Vehicles Exceeds Road Expenditures

"Since the growth in the use of the motor vehicle has been very markedly in advance of highway construction and maintenance," Chairman Anderson said, "and since it has brought with it a new and heavier form of highway traffic, it becomes evident that large funds will have to be expended if the 2,500,000 miles of rural highways in the United States are brought up to the standard of efficiency comparable to the extended use of the roadbeds.

"Another effect of improved highways, is to enable the farmer to hold his products on the farm for a longer time. Where highways are unimproved the farmer must move his produce when the roads are good, which is generally at the season when the prices are lowest. Improved highways thus make not only for a broader market but for a more stabilized one.

Regulation of Maximum Load on Highways

"The Commission believes there should be regulation of the use of the highways, especially with respect to overloading and maximum loading to be based upon the facts so developed. It will also urge that since poor highways not only increase the cost of transportation of commodities from farm to market but also affect the comfort of the farmer and prevent him and his family from a full enjoyment of communication with his neighbor, all highways wherever possible should be improved and adequately maintained."

"It is already clear," the Chairman said, "that there is a wide variation in principle and application of the various State and local regulations affecting intrastate motor traffic. Studies of local motor transportation should be expanded as rapidly as possible to afford a definite and comprehensive basis for uniform regulation of motor transportation in order that the inconvenience, expense, and inefficiency of operation occasioned by a lack of uniformity in State and Federal legislation in the future may as far as possible be avoided."

Electric street railways, the Joint Commission has found, have suffered to some extent from the encroachment of the automobile upon their revenues. "This competition," the Chairman said, "which is the first competitive activity to be felt by the street railway, has not seriously affected the revenues except in individual cases, and will not be fatal to their successful operation where these competing forms of transportation are subject to regulation and control by the proper regulatory bodies. When they are required to assume the same responsibilities as to service rendered and license fees and taxes paid they have not proved to be detrimental to existing transportation agencies."

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Chicago	Used Car Show	Apr. 26-May 4
Red Bank, N. J.	Automobile Show	May 6-13
Williamson, W. Va.	Automobile Show	May 10-13
Hartford, Conn.	Automobile Show	Sept. 4- 9

FOREIGN SHOWS

Rio de Janiero	Automotive Exhibition	Sept., 1922
Paris, France	Automobile Show	Oct., 4- 15

CONVENTIONS

Detroit	Automobile Trade Assn.	May 9-10
St. Louis	Am. Auto. Assn. Annul Meet	May 22-23
Colo. Spgs., Colo.	Automotive Equipment Assn.	June 19-24
White Sul'r Spgs., W.Va.	S. A. E. Summer Meeting	June 20-24
Olympia	Washington Automotive Trade Assn.	July 21-22

RACES

Indianapolis	500-Mile Classic	May 30
Colo. Spgs., Colo.	Pike's Peak Race	Sept. 4
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

The Railbird Looks Over the Entries for the Indianapolis Classic

By PAUL DUMAS

IT is a likely and speedly looking array of machines and men that will line up on the historic and rubber beaten bricks of the famous 2½-mile oval on Tuesday, May 30, 1922.

There will be represented the creations of America's best engineering brains tooled by America's best driving talent. When Jimmy Murphy romped home a victor in the last French Grand Prix, there was revived a respect for our ability to produce products of speed that would perform consistently. Previous to that victory of Murphy's, there was in some quarters a feeling of awe akin to blind reverence concerning the ability of the continental designers. We cannot deny that France awed us with its first 16-valve four-cylinder racing engines as exemplified in the first Peugots and Delages driven by Goux, Boillot, Duray, and Thomas, but we came back and by tearing a few pages from France's Book "How to Build a 300-in. Racer," we added the necessary touches needed to perfect a good idea and there resulted American cars of 300 in. that compared most favorably with Europe's best. The French straight eight Ballot had no sooner demonstrated that it was the last word in an 183-in. engine, than our own Duesenberg, Chevrolet and Miller set out to build a better one. That our stuff is at least as good is attested by Murphy's Duesenberg Grand Prix victory last year.

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The Pacific coast racing season gave plenty of development data, as only intensive high speed competition will do. Meanwhile Ballot has not been idle and has put in the necessary effort, so he thinks, to bring out the last mile of speed and last ounce of consistency of an admittedly good racing car. Truly, then, it will be a battle principally between straight eights, with a four and six scattered here and there to provide variety and possibly the role of Dark Horse.

Going over the list of entries to date we find that Chevrolet brothers, besides having a half-dozen or so Frontenacs as representatives of their stables, also have entered two of their rebuilt Fords which will be handled by Jack Curtner, of Greenville, Ohio, and Glenn Howard, of Indianapolis. As previously announced in this paper these cars will be kept informed of their relative position in the race by means of the radio phone.

Looking over the driving personnel of the Duesenberg organization one is inclined to conclude that they will give a presentable account of themselves. Besides the veteran De Palma and the Uniontown specialist, Red Fetterman, there is included in the team the now well established Harry Hartz, and Wallace Reid, of celluloid fame, who, if he may lack experience, will probably prove an interesting contender.

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A review of the Frontenac crew shows smiling faces as Ralph Mulford of Lozier fame and the consistent Art Kline. These provenly adequate drivers are aided and abetted by such men as Failes, Wonderlich, De Paolo, and Baker.

Rumor is our source of information concerning the linking of the name of Jules Ellingboe with the driver's seat of a Duesenberg. His first start at Indianapolis was made last May on which occasion he finished third. He enjoys considerable reputation as a dirt track driver of exceptional ability.

Eddie Hearn, who at present is confining his acrobatic tendencies to a miniature automobile in a steel lattice work globe, to the delight of vaudeville patrons will be seen astride the Disteel Duesenberg which differs only slightly from the other Duesenbergs. The feature of the car being the use of special racing disk wheels, front and rear.

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Only a few of the Harry Miller jobs are listed on the latest entry sheet, but it is safe to assume that Jimmy Murphy will handle his old Duesenberg chassis which is now equipped with one of Miller's engines, and Elliott is already formally entered with the Miller powered Leach special. It is not known at this time just how many additional Miller productions will be finally entered but at least one of the so-called Durant specials will be entered, though possibly under another name.

The DeWehr entry, assigned to Davidson, is said to carry a Rotary valve engine built by Bournonville.

France's only formal entry to date consists of the two Ballots, one to be driven by no other than the gay, popular, and efficient Jules Goux, while the selection of the driver for the other Ballot is presumably left to the good judgment of Goux. Howard Wilcox will drive his comparatively ancient but newly rebuilt Peugeot in preference to the latest Ballot offered him by Goux, so it is stated.

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Although the entry list as shown gives a total of 18 starters it is expected that at least 25 racing cars will be included in the list before the entries have been closed.

It is highly probable that Albert Guyot will bring over from France a couple of Rolland Pillian speedsters, and the entry cards filled out for three Monroes, drivers as yet unnamed, are also among the expectations of the Speedway officials. Efforts are also under way to secure a suitable mount for the speed king, Sig Haugdahl, whose ability as a driver no one at this time can deny.

It looks like a case of the eternal triangle between the teams of Chevrolet, Duesenberg and Miller, although it is known that the lady being sought after is mighty fickle and may say "yes" to some handsome foreigner or some American stranger.

Entries will be received until May 16.

NEW MASTER MOTOR BUS CHASSIS

Chicago, April 26—Master Motors, Inc., completed its first motor bus chassis today. The low center of gravity, secured by underslinging the springs and a decided kick-up of the frame over the rear axle, is one of the features. The frame is fitted with out-riggers for mounting the body, which has an overhang at the rear of only 1 in. The forward end of the chassis resembles a passenger car, in that it is completely fitted as to fenders, lamps, nickel-plated bumper, etc. The power plant consists of a Buda engine which has in unit with it the clutch and gearset.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾-1	$1650§	3¾x5	34x5†	34x5†	W
Acason RB	1½	1950	3¾x5½	36x3½	36x6	W
Acason H	2½	2750	4⅜x5¾	36x4*	36x8*	W
Acason L	3½	3450	4⅜x5¾	36x5*	36x10*	W
Acason M	5	4350	5 x6½	36x6	40x12	W
Ace C	1½	2295	3¾x5½	34x3½*	34x5*	W
Ace A	2½	2795	4¼x5½	36x4*	36x7	W
Acme 20	1	....	3¾x5	35x5†	35x5†	W
Acme 30	1½	....	3¾x5	34x3½	34x5	W
Acme 40	1½	....	3¾x5	34x3½	34x5	W
Acme 60	3	....	4⅛x5¼	36x4	36x7	W
Acme 60L	3	....	4½x5½	36x4	36x7*	W
Acme 90	4½	....	4½x5½	36x5	40x10	W
Acme 125	6½	....	4¾x6	36x6	40x12	W
American 25	2½	3350	4 x6	36x4*	36x4d*	W
American 40	4	4275	4½x6	36x5*	36x5d*	W
Apex G	1	1450††	3½x5	33x5†	33x5†	1
Apex D	1½	1915	3¾x5⅛	34x3½	34x4	1
Apex E	2½	2695	4¼x5½	36x4	36x7	1
Apex F	3½	3975	4½x6	36x5	36x10	1
Armleder 20	1	2350	3¾x5¼	34x3½*	34x5*	W
Armleder 21	1½	2425	3¾x5¼	34x3½	34x6	W
Armleder 40	1½	2850	4⅛x5¼	34x3½	36x6	W
Armleder HW	2½	3200	4¼x5½	36x4*	36x7*	W
Armleder KW	3½	4150	4½x6	36x5	36x5d	W
Atco B	1½	....	3¾x5¼	34x5†	36x6†	1
Atco B1	1½	....	3¾x5¼	34x5†	36x6†	1
Atco A	2½	....	4¼x5½	36x††	36x8*	W
Atlas MD	1	1185	3½x5	32x4½†	32x4½†	W
Atterbury 20R	1½	2475	3¾x5	31x3½	34x5	W
Atterbury 7CX	2½	3175	4⅛x5¼	36x4	36x4d	W
Atterbury 7D	3½	3975	4½x5½	36x5	40x5d	W
Atterbury 8E	5	4975	4¾x6	36x5	40x6d	W
Autocar 21UF	1½-2	1950	4¾x4½	34x4*	34x5*	D
Autocar 21UG	1½-2	2050	4¾x4½	34x4*	34x5*	D
Autocar 27H	2	2950	4 x5½	34x5	36x7	D
Autocar 27K2	2	3075	4 x5½	34x5	36x7*	D
Autocar 26Y	5	3950	4¼x5½	34x6	36x12	D
Autocar 26-B	5	4100	4¼x5½	34x6	36x12	D
Available H1½	1½	2475	4 x5½	36x3½*	36x5*	W
Available H2	2	2775	4 x5½	36x3½*	36x6*	W
Available H2½	2½	3160	4 x5½	36x4*	36x8*	W
Available H3½	3½	4175	4½x5½	36x5	40x5d	W
Availabl H5	5	5375	4¾x6	36x6	40x12	W
Avery	1	....	3 x4	34x5†	34x5†	1
Beck A Jr.	1	1850	3½x5	32x4½	33x5	1
Beck B-30	1½	2050	3¾x5	34x5	36x6	
Beck C-40	2	2150	3¾x5	36x6	36x6	
Beck D-50	2½	2850	4⅛x5¼	38x7	40x8	
Bell (Penn.)	½	1000	3½x5	31x4§	31x4	B
Bell M (Iowa)	1	1495	3⅝x5⅛	35x5	35x5†	W
Bell E (Iowa)	1½	2100	3¾x5¼	34x3½	34x5	1
Bell O (Iowa)	2½	2550	4½x5½	34x4	34x6	1
Belmont A	½	725	3¾x4¼	31x4	31x4	B
Belmont D	2	2575	4¼x5½	34x3½*	34x6*	1
Belmont F	3	3500	4 x6	36x5*	36x5d*	1
Bessemer G	1	....	3½x5	35x5†	35x5†	1
Bessemer H-2	1½	....	3¾x5	36x3½	36x5	1
Bessemer J-2	2½	....	4½x5¼	36x4	36x4d	1
Bessemer K-2	4	....	4½x5½	36x5	36x10	1
Big 4 H	3½-4	5000	4½x6	36x6	36x6	W
Big 4 T	4	5500	4¾x6	36x6	36x6	W
Big 4 K	7	6000	5½x6	36x6	36x6	W
Big 4 HA	7	6000	4½x6	36x6	36x10	W
Brinton C	1½	1590	3¾x5	34x4	34x5	W
Brinton D	2½	2250	4⅝x5¼	36x4	36x7	W
Brockway E	1	....	3¾x5⅛	35x5†	35x5†	B
Brockway S-5	1½	....	3¾x5	36x3½*	36x5*	W
Brockway SK	1½	....	4⅛x5¼	36x4	36x6	
Brockway KR	2½	....	4½x5½	36x4	36x8	
Brockway K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway RT	3½	....	4¾x6	36x5	36x10	
Brockway R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway T-4	5	....	4¾x6	36x6	40x6d	W
Buick Delivery	....	945††‡	3⅜x4¾	31x4†	31x4†	B
Capitol G	1½	2975	3¾x5	35x5	38x7	W
Capitol H2	2½	3700	4¼x6	36x4	38x8	W
Capitol K2	2½	4250	4¼x6	36x6	42x9	W
Capitol M3	3½	4425	4¼x6	36x5	36x10	W
Case	2	....	4¼x5¾	36x6	38x7	1
Champion Light Commercial	¾	1050††	3½x5	32x3½	32x3½	1
Chevrolet G	¾	745	3½x4	31x4†	34x4½†	B
Chevrolet T	1	1125	3½x5¼	33x4†	35x5†	W
Chicago C1	1½	....	3¾x5⅛	36x3½*	36x5*	W
Chicago C2	2½	....	4 x5⅛	36x4*	36x7*	W
Chicago C3	3½	....	4½x5½	36x5	36x10	W
Chicago D5	5	....	4½x5½	36x6	40x12	W
Climber A-20	1½	2050	3½x5	36x6*	38x7*	1
Clydesdale 10	¾-1½	1485	3¾x5	34x5	34x5	B
Clydesdale 18	¾-1½	1890	3¾x5	34x5	34x5	W
Clydesdale 20	1-1½	2385	3¾x5	34x5	34x5*	W
Clydesdale 42	1½-2	2475	3¾x5	36x3½	36x6	W
Clydesdale 65X	2½-3	3250	4½x5¼	36x4	36x8	W
Clydesdale 65EX	2½-3	3450	4½x5½	36x4	36x8	W
Clydesdale 90	3½-4½	4100	4½x5½	36x5	36x10	W
Clydesdale 120	5-6	4500	4¾x6	36x6	40x12	W
Columbia H	1½	1895	4 x5	35x5	38x7†	1
Columbia G	2½	2335	4 x5¼	36x4	36x7	1
Comet T	1½	1950	3¾x5	34x4	34x4	W
Commerce T	¾-1½	1450	3¾x5	34x4½†	34x4½†	B
Commerce 12	1½	1800	3¾x5	35x5†	35x5†	1
Commerce 16	2	2150	3¾x5	35x5†	36x6	1
Commerce 18	2½	2495	4⅛x5¼	36x6†	36x7†	1
Commerce 25	2½	2425	4½x5¼	36x4	36x7	W
Concord A	2	$3150	4 x5½	36x3½	36x6	W
Concord B	3	3600	4¼x5½	36x4	36x8	W
Concord AX	2	3250	4 x5½	36x3½	36x6	W
Concord BX	3	3600	4½x5½	36x4	36x8	W
Cook 51	2½	3600	4 x5⅛	36x6†	40x8†	W
Corbitt E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt D-22	1½	2200	3¾x5	34x3½	34x4	W
Corbitt C-22	2	2600	4⅛x5¼	36x3½	36x6	W
Corbitt B-22	2½	3000	4½x5¼	36x4	36x7	W
Corbitt R-22	3	3200	4½x5½	36x4	36x8	W
Corbitt A-22	3½-4	3800	4½x5½	36x5	36x10	W
Corbitt AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder AS	1	1600	3¾x5	35x5†	35x5†	W
Day-Elder B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder D	2	2400	4¼x5¼	36x4	36x7	W
Day-Elder C	2½	2750	4¼x5½	36x4	36x7	W
Day-Elder F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder E	5	4250	4½x6	36x5*	40x6d*	W
Dearborn E	1	1600	3⅝x5⅛	35x5†	35x5†	W
Dearborn FX	1½	2300	3¾x5⅛	34x4	34x5	W
Dearborn F	1½	2180	3¾x5⅛	34x4	34x5	W
Dearborn 48	2	2590	3¾x5⅛	34x4½†	34x7	W
Defiance G	1	1695§	3¾x5	35x5†	35x5†	B
Defiance D	1½	2095§	3¾x5	35x5†	36x6†	1
Defiance E	2	2275§	3¾x5	35x5†	38x7†	1
DeMartini 1½	1½	2600	3¾x5	34x3½	34x6	W
DeMartini Z	2	3300	4 x5½	36x3½	36x7	W
DeMartini 3	3	4250	4¼x5½	36x4	36x10	W
DeMartini 4	4	4800	4½x6	36x5	36x12	W
Denby 31	1¼	1485	3½x5	35x5†	35x5†	B
Denby 33	1½	2145	3¾x5	35x5†	38x7†	1
Denby 34	2	2395	3¾x5	36x3½	36x6	1
Denby 35	2½-3	2795	4⅛x5¼	36x4	36x7	1
Denby 27	4	3395	4½x5½	36x5	36x5d	1
Denby 210	5	4295	4½x5½	36x6	40x6d	1
Dependable A	¾-1	1650	3⅝x5⅛	34x5†	36x6†	W
Dependable C	2	2350	3¾x5¼	34x3½	34x5	W
Dependable D	2½	2850	4 x5½	34x5	36x6	W
Dependable E	3	2950	4¼x5½	36x4	36x7	W
Diamond T O-8	1-1½	1975	3¾x5¼	36x3½‡	36x4†	W
Diamond T FS	1½	2525	3¾x5¼	36x3½	36x5	W
Diamond T T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T U	2-2½	2650	4 x5¼	36x4	36x7	W
Diamond T K	3½	3750	4¼x5½	36x5	36x5d	W
Diamond T EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T S	5	4500	4¾x6	36x6	40x6d	W
Diehl A	1	....	3½x5	34x4½	35x5	1
Diehl B	1½	....	3½x5	36x6	36x6	1
Dispatch F	1	1350	3¾x5	34x4†	34x4†	1
Doane	2½	4100††	4¼x5¾	36x5	36x7	C
Doane	3½	5100††	4⅜x5¾	36x5	36x5d	C
Doane	6	6000††	5 x6¼	36x6	40x6d	C
Dodge Brothers	½	730	3⅞x4½	32x4†	32x4†	B
Dorris K-4	2-2½	3100	4¼x5½	36x4	36x7	W
Dorris K-7	3½	4400	4¼x5½	36x5	36x10	W
Dort 103	½	685	3½x5	31x4	31x4	B
Double Drive B	3	4000	4¼x5½	6	6	W
Duplex A	2	2775	4 x5¼	35x5†	38x7†	W
Duplex E	3½	3500	4¼x5½	36x8	36x8	1
Duty 22	2	1590	3½x5	34x3½	34x5	1
Eagle 100-X	1½	....	3⅝x5½	34x5	34x5	1
Eagle 100-2	2	2275	3¾x5¼	34x4*	34x7*	1
Erie E	1½	2185	3¾x5¼	36x6†	36x6†	W
Erie A	2½	2985	4¼x5½	36x4	36x4d	W
F. W. D. B	3	4200	4⅜x5½	36x6	36x6	B
Facto 1921	2½	2295‡	4¼x5½	36x4*	36x8*	W
Fageol 1½	1½	3000	3¾x5¼	34x3½‡	34x6*	W
Fageol 2½	2½	3900	4¼x5¾	34x4	36x7	W
Fageol 3½	3½	5000	4½x6¼	36x5*	40x5d*	W
Fageol 5	5	5709	4½x6¼	36x6	40x6d	W
Fargo R	2	1900	3¾x	36x4	36x6	1
Federal SD	1½	1800	3¾x5	35x5†	36x6†	W
Federal TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal UE	2-2½	2425	4½x5¼	36x4	36x7	W
Federal WE	3½-4	3150	4½x5½	36x5	36x5d	W
Federal X2	5-6	4500	4¾x6	36x6	40x6d	W
Ford TT	1	400	3¾x4	30x3½†	32x4½†	W
Forschler A	1	....	3½x5	34x3	34x4	W
Forschler AX	1½	....	3½x5	36x3½	36x5	W
Forschler B	2	....	4½x5¼	36x4	36x7	W
Forschler BX	3	....	4½x5¼	36x4	36x8	W
Front Drive C	1½	2800	3¾x5½	5	4	W
G & J** 20	1	2275	3⅝x5⅛	34x5†	34x5†	W
G & J** A	2-2½	3375	4x5¼	36x4	36x7	W
G & J** B	3½-4	4475	4½x5½	36x5	36x10	W
G.M.C. K16	1	1495	3½x5½	34x5†	34x5†	B
G.M.C. K-41A	2	2775	4 x5½	36x4*	36x7*	W
G.M.C. K-41B	2	2775	4 x5½	36x4*	36x7*	W
G.M.C. K-71A	3½	3950	4½x6	36x5	40x5d	W
G.M.C. K-71B	3½	4050	4½x6	36x5	40x5d	W
G.M.C. K-101A	5	4350	4½x6	36x5	40x6d	W
G.M.C. K-101B	5	4450	4½x6	36x5	40x5d	W
G.W.W.	1½	1950	3¾x5½	35x5	35x5	W
Garford 15	¾	1590	3⅝x5⅛	34x5†	34x5†	W
Garford 25-B	1	1990	3¾x5⅛	36x6†	36x6†	W
Garford 70-H	2	2750	4¼x5½	36x4	36x7	W
Garford 77-D	3½	$3750	4½x6	36x5	36x6d	W
Garford 68D	5	4500	5 x6½	36x6	40x6d	W
Garford 150-A	7½	5200	5½x6	36x6	40x7d	C
Gary F	1-1½	1675	3¾x5	36x3½	36x4	W
Gary I	2	2150	4 x5½	36x3½	36x6	W
Gary J	2½	2550	4¼x5½	36x4	36x8	W
Gary K—†	3½	3550	4½x6	36x5	40x5d	W
Gary M	5	4000	5 x6½	36x6	40x6d	W
Gersix M	1½	3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gerasix	3½	4500	4½x6	36x5	40x12	W
Golden West GH	3	4500	4½x6	36x7	36x7	W
Golden West G	3½	5000	4½x5½	36x6	36x6	W
Graham Bros. 1-Ton	1	1265	3⅞x4½	33x4½†	34x5†	B
Graham Bros. 1½-Ton	1½	1325	3⅞x4½	33x4½†	36x6†	B
[1]Gramm-Pion. 10	1	1365	3½x5	33x5†	33x5†	F
[1]Gramm-Pion. 15	1½	1900§	3¾x5	36x3½*	36x5*	1
[1]Gramm-Pion. 65	1½	2500§	3¾x5	36x3½*	36x5	W
[1]Gramm-Pion. 20	2	2925§	4½x5¼	36x4*	36x7*	W
[1]Gramm-Pion. 30	3	3275§	4¼x5½	36x4*	36x4d*	W
[1]Gramm-Pion. 75P	3½	4225§	4½x5½	36x6†	42x9†	W
[1]Gramm-Pion. 40	4	3995§	4½x5½	36x5	36x5d*	W
[1]Gramm-Pion. 50	5-6	4895§	4¾x6	36x6	40x6d*	W
Hahn B2	1	1700§	3¾x5	34x5*	34x5*	W
Hahn O	1½	1900	4½x5½	36x3½*	36x6*	W
Hahn K	2	2225	4½x5½	36x4*	36x8*	W
Hahn L	3	2900	4½x5½	36x5*	36x10*	W
Hahn M	5	3500	4¾x6	36x6	40x12	W
Hahn N	6	4500	4¾x6	36x6	40x12	W
Hal-Fur E	1½	2350	4 x5½	34x5†	38x7†	W
Hal-Fur B	2½	3000	4¼x5½	36x6†	36x8	W
Hal-Fur F	3½	4000	4½x5½	36x6†	40x10	W
Hall 1½	1½	3100	3¾x5	34x5†	38x7†	W
Hall 2½	2½	3275	4½x5¼	36x4	36x6	W
Hall 3½	3½	4100	4½x5½	36x5	36x5d	W
Hall 5	5	5100	4½x5½	36x5	40x6d	W
Hall 7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey WFA	2½	2950	4¼x5½	36x4	36x7	W
Harvey WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye K	1½	1850	3¾x5½	34x3½*	34x5*	1
Hawkeye M	2	2650	4¼x5	36x4*	36x6*	1
Hawkeye N	3½	3700	4½x6½	36x5*	36x10*	1
Hendrickson O	1½	2200	3⅝x5½	36x4†	35x5†	W
Hendrickson N	2½	2690	4¼x5⅜	36x4*	36x7*	W
Hendrickson M	3½	3000	4¼x5	36x5*	36x5d*	W
Hendrickson K	5	4000	5 x6¼	36x6	40x6	W
Huffman B	1½	1995	3⅜x5	34x3½	34x6	W
Huffman C	1½	1795	3⅜x5⅛	34x3½	34x6	1
Hurlburt A	1½	2850	4 x5½	34x4	34x5	W
Hurlburt B	2½	3750	4¼x5½	36x4	36x4d	W
Hurlburt C	3½	4590	4½x6	36x5	36x5d	W
Hurlburt D	5	5500	4½x6	36x5	40x6d	W
Indep'd't(Iowa), B	1	1665	3½x5	34x3½	34x4	1
Indep'd't(Iowa), G	1½	2040	3¾x5¼	34x3½	34x5	1
Indep'd't(Ia.) HI	2½	2940	4½x5¼	36x4	36x4	1
Indep'd't(Ohio) F	1½	2385	3¾x5	36x3½	36x5	W
Indep'd't(Ohio) H	2½	3085	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio) K	3½	3985	4½x5½	36x5	36x5d	W
Indiana 12	1½	....	3¾x5¼	34x3½*	34x5*	W
Indiana 20	2	....	4½x5¼	36x4*	36x7*	W
Indiana 25	2½	....	4½x5½	36x4*	36x8*	W
Indiana 35	3½	....	4⅝x5½	36x5*	36x5d*	W
Indiana 51	5	....	5 x6¼	36x5*	40x6d*	W
Inland D	2	2950	4 x5	34x5	34x6	I
International S	¾	1500	3½x5	34x5†	34x5†	I
International 21	1	1750	3½x5¼	36x3½	36x3½	I
International 31	1½	1850	3½x5¼	36x3½	36x4	I
International 41	2	2100	3½x5¼	36x3½	36x5	I
International 61	3	2400	4¾x5	36x4	36x6	I
International 101	5	3600	4¾x5	36x5	40x10	I
J & J D	2	3250	4 x5	34x4*	34x6	I
Jackson 4WD	3½	3850	4½x5½	36x7	36x7	B
Jumbo 15	1½	2425	3¾x5¼	36x3½	36x5	I
Jumbo 20	2	2675	3¾x5¼	35x5†	38x7†	I
Jumbo 25	2½	3090	4½x5½	36x4	36x7	I
Jumbo 30	3	3590	4½x5½	36x6†	42x9†	I
Jumbo 35	3½	4080	4½x6	36x5	36x10†	I
Jumbo 40	4	4730	4½x6	38x7†	44x10	I
K-Z 1	1	1750	3½x5	34x3½	34x5	W
K-Z 1½	1½	2075	3¾x5	36x4	36x6	W
K-Z 2½	2½	2550	4⅛x5¼	36x4	36x8	W
K-Z 3½	3½	3350	4½x5½	36x5	40x10	W
K-Z 5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo G-2	1½	2890§	3¾x5	36x4	36x6	W
Kalamazoo H	2½	3275§	4 x6	36x4	36x8	W
Kalamazoo K	3½	4000§	4½x6	36x5	36x10	W
Kalamazoo K-5	5	4500§	4½x6	36x6	36x6d	W
Karavan A	2½	3750	4½x6	36x4	36x8	I
Kearns H	1	1450	3½x5	32x4½†	32x4½†	I
Kearns N	2	1650	3½x5	34x3½	34x6	I
[2]Kelly-S. K-31	1½	2700	3¾x5¼	36x3½	36x6	C
[2]Kelly-S. K-34	1½	2700	3¾x5¼	36x3½	36x6	C
[2]Kelly-S. K-38	2½	2900	3¾x5¼	36x4	36x4d	C
[2]Kelly-S. K-35	2½	2900	3¾x5¼	36x4	36x4d	C
[2]Kelly-S. K-40	3½	3900	4½x6½	36x5	40x5d	C
[2]Kelly-S. K-41	3½	2900	4½x6½	36x5	40x5d	C
[2]Kelly-S. K-42	3½	3900	4½x6½	36x5	40x5d	C
[2]Kelly-S. K-50	5	....	4½x6½	36x6	40x6d	C
[2]Kelly-S. K-60	6	....	4½x6½	36x6	40x7d	C
Keystone 40	2	2175	3¾x5⅛	34x5†	38x7†	W
Kimball AB	2	3675	4 x6	36x4	38x7	W

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. ††Pneumatic Tires. d—dust. All others solid. ††Price includes body. §—Price includes several items of equipment.

1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Kimball.......AC	2½	$3975	4¼x6	36x4	36x8	W
Kimball.......AK	3	4500	4½x6	36x4	36x10	W
Kimball.......AE	4	5000	4¾x6	36x5	40x12	W
Kimball.......AF	5	5500	5 x6	36x6	40x7d	W
Kissel....Express	1	1585†	3⅞x5½	34x5†	34x5†	W
Kissel.....Utility	1½	1975	3⅞x5½	36x3½	36x5	W
Kissel...Freignter	2½	2875	4¼x5½	36x4	36x7	W
Kissel......H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber........AA	1	2200	4⅛x5¼	34x3½*	34x5*	W
Kleiber........A	1½	3100	4⅛x5¼	36x3½*	36x6*	W
Kleiber........BB	2	3600	4⅛x5¼	36x4*	36x7*	W
Kleiber........B	2½	3950	4½x5½	36x5*	36x8	W
Kleiber........C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber........D	5	5300	5 x6½	36x6	40x12	W
Koehler........D	1½	1995	3½x5	34x3½	34x5	W
Koehler........M	2½	3175	4 x5⅛	36x4	36x7	W
Koehler.....MCS	2½	3275	4 x5⅛	36x4	36x7	W
Koehler........F	3½	4150	4½x5½	36x5	36x10	W
Koehler,Mf. Trac	5	3275	4 x5⅛	36x4	36x7	W
Krebs-Collier..23	¾	1260	3¾x5	34x4½	34x4½	B
Krebs-Collier..24	1	1565	3¾x5	34x5	34x5	W
Krebs-Collier..45	1½	2125	4⅛x5¼	36x4	36x7	W
Krebs-Collier..75	2½	2375	4½x5½	36x4	36x8	W
Krebs-Collier.110	3½	2975	4½x5½	36x5	40x10	W
Lange..........B	2½	3350	4⅛x5¼	36x4*	36x7*	C
Larrabee......X-2	1	1925	3¼x4½	34x5†	34x5†	B
Larrabee........U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee........J	1½-2½	2400	3¾x5	34x3½*	34x5*	W
Larrabee........K	2½	3100	4⅛x5¼	36x4	36x7	W
Larrabee......K-5	2½-3	3450	4½x5½	36x4	36x8	W
Larrabee......L-4	3½	4000	4½x5½	36x5	36x5d	W
Larrabee.......W	5	4800	4¾x6	36x6	40x6d	W
Luedinghaus....C	1	1690	3½x5	35x5†	35x5†	W
Luedinghaus...W	1½	2490	3¾x5¼	34x3½*	34x5*	W
Luedinghaus...K	2-2½	2790	4¼x5¾	36x4*	36x7*	W
Maccar.........L	1½	2700	4⅛x5¼	36x4	36x6	W
Maccar......H-A	2	3100	4⅛x5¼	36x4	36x4d	W
Maccar......H-2	3	3400	4½x5½	36x4	36x5d	W
Maccar......H-3	4	4200	4½x5½	36x5	36x6d	W
Maccar.........G	5-6	4950	4¾x6	36x5	40x6d	W
MacDonald.....A	7½	5750	4½x6	40x7	40x14	I
Mack...AB D.R.	1½	3150	4 x5	36x4	36x3½d	D
Mack...AB Chain	1½	3300	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack....AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack....AB D.R.	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac....AB	5	3100	4 x5	36x4	36x4d	C
Mack Trac....AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac....AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac....AC	13	5750	5 x6	36x6	40x12	C
Mack Trac....AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf...AA**	2	3775	4 x5¼	36x4	36x7	W
Mapleleaf...BB**	3	4350	4¼x5½	36x4	36x4d	W
Mapleleaf...CC**	4	5100	4½x5½	36x5	36x5d	W
Mapleleaf..DD**	5	6200	4½x5½	36x6	40x6d	W
Master.......JW	1½	2290	4⅛x5½	34x3½	34x5	W
Master.......JD	1½	2590	4⅛x5½	34x3½	34x5	D
Master.........Z	2	2290	4⅛x5½	34x3½	34x5	W
Master........W	2½	2890	4¼x5½	34x4	36x7	W
Master.......DD	2½	3190	4¼x5½	34x4	36x7	D
Master.........A	3½	3990	4½x6	36x5	40x5d	W
Master.........E	3½	4290	4½x6	36x5	40x5d	D
Master.........Y	4	4490	4½x6	36x5	40x6d	D
Master.........B	5	4990	4¾x6½	36x6	40x6d	W
Master.........F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3390	4¼x5½	34x4	36x7	D
Maxwell......1½	1½	932	3⅝x4½	32x3	32x4	W
Menominee...HT	1-1¼	2000	3¾x5	34x3½	36x5	W
Menominee....H	1½	2175	4 x5	36x3½	36x5	W
Menominee....D	2-2½	2875	4 x6	36x4	36x8	W
Menominee....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4350	4¾x6	36x6	40x12	W
Moline.........10	1½	1985	3½x5	34x5†	36x6†	I
[3]Moreland..R. R.	1	1595	4 x5	34x5†	34x5†	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6*	W
Moreland.....EX	2	2800	4⅛x5¼	36x4	36x7*	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10*	W
Moreland.....RX	4½-5	4600	4¾x6	36x6	40x6	W
Napoleon........7	¾	1350	3½x5	38x4	33x4†	I
Napoleon........9	1	1535	3½x5	35x5*	35x5*	I
Napoleon.......11	1½	1860	3½x5	35x5*	36x6*	I
Nash.........2018	1-1½	1595	3¾x5¼	35x5	36x6	I
Nash.........3018	2-2½	2150	3¾x5¼	36x6	40x8	I
Nash.......Quad.	2-2½	2750	4¼x5½	40x8	40x8	I
Nash..3018, LWB	2-2½	2200	3¾x5¾	36x6	40x8	I
Nash. Quad. LWB	2-2½	2800	4¼x5½	40x8	40x8	I
Nash........5018	2½	2250	3¾x5¼	34x4	34x6	I
[4]Nelson.....F1½	1½	....	4⅛x5¼	36x3½	36x5	W
[4]Nelson.......F2	2	....	4⅛x5¼	36x4	36x7	W
[4]Nelson.....F3½	3½	....	4½x5½	36x5	36x5d	W
[4]Nelson.....FC5	5	....	4¾x6	36x6	40x6d	W
Netco.........DK	2	3100	4⅛x5¼	36x4*	36x7*	W
Netco.........HL	2½	3500	4½x5½	36x4*	36x8*	W
New York......M	1½	....	4⅛x5¼	36x3½	36x5	W
New York.......N	2-2½	....	4⅛x5¼	36x4	36x4d	W
Niles...........E	2	3000	4⅛x5¼	36x4*	36x7*	W
Noble........B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble........C40	2	....	4 x5½	36x4	36x7	W
Noble........D50	2½	....	4¼x5½	36x4	36x8	W
Noble........E70	3½	....	4½x6	36x5	36x10	W
Northway.....B-2	2	3400	4 x6	36x4	36x4d	W
Northway.....B-3	3½	4400	4 x6	36x5	40x5d	W
Northwestern..W	1½	2700	4⅛x5¼	34x4	36x6	W
Northwestern.WS	2½	$3500	4½x5½	36x4	36x8	W
Norwalk......25E	1	1595	3½x5	34x3½	34x4	W
Norwalk......35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
O. K...........K1	1½	2450	4 x5½	36x3½	36x5	W
O. K...........L1	2½	3250	4¼x5½	36x4	36x8	W
O. K..........M1	3½	4250	4½x6	36x5	36x5d	W
Ogden..........D	½	....	3¾x5	36x3½	36x5	W
Ogden..........D	1½	....	3¾x5	36x3½	36x5	W
Ogden..........E	2½	....	4⅛x5¼	36x4	36x8	W
Old Hickory...W	1	1775	3¾x5	36x3½*	36x4*	W
Old Reliable....A	1½	2350	4 x5	34x4	36x6	W
Old Reliable....B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4¼x6	36x5	36x5d	W
Old Reliable....D	5	5250	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6¼	36x6	40x7d	C
Oldsmobile Econ.	1	1095	3 11/16x5¼	35x5†	35x5†	I
Olympic.........A	2½	3200	4¼x5½	36x4	36x8	W
Oshkosh........A	2	3250	3½x5	36x6†	36x6†	4
Oshkosh.......AA	2	3400	3½x5	36x6†	36x6†	4
Oshkosh........B	2½	3850	4 x5⅛	38x7†	38x7†	4
Oshkosh.......BB	2½	4000	4 x5⅛	38x7†	38x7†	4
Overland........4	½	450	3⅜x4	30x3½	30x3½	B
Packard......EC	1½-3	3100	4 1/16x5½	36x4	36x7	W
Packard......EX	1½-3	3100	4 1/16x5½	36x6†	40x8†	W
Packard......ED	2-4½	4100	4½x5½	36x5	36x5d	W
Packard.......EF	4-7½	4500	5 x5½	36x6	40x6d	W
Paige......52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige......54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige......51-18	3½	3145	4½x5½	36x5	36x5d	W
Parker......C-22	1	1875	3¾x5¼	34x5†	34x5†	W
Parker......G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.......J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot... Revere	1	1380	3¾x5	35x5†	35x5†	W
Patriot... Lincoln	2	2050	4 5¼	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Piedmont....4-30	1	1200	3½x5	34x4†	34x4†	W
Pierce-Arrow....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow....	3½	4350	4½x6¾	36x5	36x5d	W
Pierce-Arrow....	5	4850	4½x6¾	36x5	40x6d	W
Pioneer.........59	1	1550	3¾x4¼	32x4½†	32x4½†	W
Pittsburgher.....	1½-2	3000	3⅝x5	36x4	36x6	
Pittsburgher.....	3	3800	4⅛x5¼	36x5*	36x8	W
Power..........F	2	3150	3¾x5¼	36x5	36x7	W
Power..........C	3½	4250	4¼x5½	36x5	40x10	W
Premocar...B-143	1½	2475	3½x5	36x6†	36x6†	W
Rainier......R-21	¾	1990	3½x5	35x5†	35x5†	W
Rainier......R-19	1	2150	3½x5	34x3½	34x4	W
Rainier......R-16	1½	2490	3¾x5	34x3½	34x5	W
Rainier......R-18	2	2890	4⅛x5¼	34x4	34x6	W
Rainier......R-20	2½	3550	4⅛x5¼	34x4	34x7	W
Rainier......R-15	3½	4400	4½x5½	36x5	36x5d	W
Rainier......R-17	5	5100	4½x6	36x6	36x6d	W
Ranger..TK-22-2	1½	2450	3¾x5	36x6†	38x7†	W
Reo.............F	¾-1¼	1245	4⅛x4½	34x4½†	34x4½†	B
Reliance......10A	1½	2400	4 x5⅛	36x3½	36x5	I
Reliance......20B	2½	3100	4¼x5½	36x4	36x4d	I
Republic.......75	¾	1395††	3½x5	32x4½†	32x4½†	I
Republic.......10	1	1395	3¾x5	34x3	34x4	I
Republic.. 10 Exp	1	1695	3¾x5	35x5†	34x5†	I
Republic.....11X	1½	1795	3¾x5	34x3½	34x6	I
Republic.......19	2½	2195	4⅛x5¼	36x4	36x7	I
Republic.......20	3½	3095	4½x5½	36x5	36x10	I
Rowe.........CW	1½	3000	3¾x5	36x6†	36x6†	W
Rowe....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe....G.P.W.	3	5250	3¼x5‡	38x7†	42x9†	W
Rowe.........HW	4	4500	4¼x6	36x5	36x6d	W
Rowe.......F. W.	5	5500	4½x6	36x6	40x6d	W
Ruggles........20	1	1195	3¾x5	34x5†	34x5†	B
Ruggles........40	2	1795	4 x5	34x5†	34x7	D
Sandow.........G	1	2295	3¾x5	34x3½	34x5	W
Sandow.......CG	1½	2590	3¾x5	34x4	34x6	W
Sandow..........J	2½	3275	4⅛x5¼	36x4	36x7	W
Sandow.........M	3½	4295	4½x5½	36x5	36x5d	W
Sandow..........L	5	4975	4½x5½	36x6	40x6d	W
Sanford........25	2½	....	4⅛x5¼	36x4	36x4d	W
Sanford........35	3½	....	4½x5½	36x5	36x5d	W
Sanford........50	5	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4¼x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz........A	1	1625	3½x5	33x4½†	33x4½†	B
Schwartz......BW	1½	2690	3¾x5¼	34x3½*	34x7*	W
Schwartz. C.W.S.	2½	3200	4¼x5½	36x4	36x8	W
Schwartz.....DW	5	4900	4½x6	36x6	40x12	W
Selden.........30	1½	2250	3¾x5	34x3½	34x5	W
Selden.........31	1½-2½	3350	4⅛x5¼	34x5	38x7	W
Selden.........50	2½	3250	4⅛x5¼	36x4	36x7	W
Selden.........51	2½-3½	4350	4½x5½	36x6†	40x8†	W
Selden.........70	3½-5	3750	4½x5½	36x5	36x10	W
Selden.........90	5-7	4950	4¾x6	36x6	40x12	W
Seneca.........M	½	820	3⅛x4½	30x3½†	30x3½†	B
Service.........12	¾	....	3¼x4½	32x4½†	32x4½†	B
Service.........15	1¼	....	3⅜x5	34x4½†	35x5†	B
Service.........21	1½	....	3½x5⅛	34x3½	34x5	W
Service.........32	2	....	4 x5½	36x3½	36x7	W
Service.........37	2	....	4¼x5½	35x5†	38x7†	W
Service.........52	3	....	4¼x5½	36x4	36x8	W
Service.........72	3½	....	4¼x5½	36x5	36x5d	W
Service.........77	4	....	4½x6	36x5	36x5d	W
Service........102	6	....	4½x6	36x6	40x6d	W
Signal.........NF	1	$1950	3¾x5	34x5†	36x6†	W
Signal..........H	1½	2450	4⅛x5¼	34x4	36x6	W
Signal...........J	2½	2875	4⅛x5¼	34x4	36x8	W
Signal..........M	3½	3675	4½x5½	36x5	40x5d	W
Signal..........R	5	4400	4¾x6	36x6	40x6d	W
Southern......10	1	2090	3¾x5	34x3½	34x4	W
Southern......15	1½	2590	3¾x5⅛	36x6†	34x4	W
Southern......20	2	2990	4¾x5¼	36x6†	40x8*	W
Standard.....1-K	1½	1600	3¾x5	34x3½*	34x5*	W
Standard.......76	2½-3	2400	4⅛x5¼	36x4*	36x7*	W
Standard.......66	3½-5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5-7	4400	4¾x6	36x6	40x12	W
Sterling.......1½	1½	2885	4 x5¾	36x3½*	36x5*	W
Sterling.........2	2	3085	4 x5¾	36x4*	36x6*	W
Sterling.......2½	2½	3290	4⅜x5¾	36x4*	36x4d*	W
Sterling.......3½	3½	4325	4½x6¼	36x5*	40x5d*	W
Sterling......5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling......5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.......7½	7½	6000	5 x6¼	36x6	40x7d	C
Stewart........14	¾	1245	3⅜x5⅛	32x4½†	32x4½†	I
Stewart........15	1	1445	3⅜x5⅛	35x5†	35x5†	I
Stewart.........9	1½	1790	3¾x5	34x3½	34x5	I
Stewart.........7	2	2190	4⅛x5¼	34x4	34x7	I
Stewart......7-X	2½	2390	4¼x5½	34x4	34x7	I
Stewart........10	3½	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½	3190	4½x6	36x5	36x5d	I
Stoughton......C	¾	1240	3½x5	34x4½†	34x4½†	W
Stoughton......A	1	1790	3¾x5¼	34x5	34x5	W
Stoughton......B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton......D	2	2490	4 x5⅛	36x4	36x7	W
Stoughton......F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan........E	2	2800	4¼x5½	36x4*	36x7*	W
Sullivan........H	3½	3750	4½x6	36x5	36x5d	W
Superior........D	1	1650	3¾x5	34x4½†	34x4	I
Superior........E	2	2600	4⅛x5¼	36x4	36x6	I
Super Truck...50	2½	3300	4 x6	36x4	36x8	W
Super Truck...70	3½	4300	4¼x6	36x5	40x5d	W
Super Truck..100	5	5300	4¾x6	36x5	40x12	W
Super Truck..150	7½	6300	5 x6	36x6	40x7d	W
Texan........A38	¾	1095	3½x5	33x4	33x4	I
Texan......TK39	1½	1550	3½x5	36x6	38x7	W
Thomart SpeedT'k	1¼	1795	4 x5¼	34x5	34x5	B
Tiffin.........GW	1½	2100	4⅛x5¼	36x3½	36x5	W
Tiffin........MW	2½	2700	4⅛x5¼	36x4	36x3½d	W
Tiffin.........PW	3½	3600	4½x5½	36x5	40x5d	W
Tiffin.........F50	5	4300	4¾x6	36x6	40x6d	W
Tiffin.........F60	6	4500	4¾x6	36x6	40x12	W
Titan..........	2	2950	4x5½	34x4*	36x7	I
Titan..........	3½	3950	4¼x5½	36x5	40x10	I
Titan..........	5	4550	4½x6	36x5	40x6d	I
Titan.... 6-Ton	6	5150	4½x6	36x5	40x12	I
Tower...........J	1½	2900	4⅛x5¼	35x5	38x7	W
Tower..........H	2½	3200	4⅛x5¼	36x4	36x7	W
Tower..........C	3½	4100	4½x5½	36x5	36x5d	W
Traffic.........C	...	1595	3¾x5	34x3½*	34x5*	I
Traffic..........	3	1895	3¾x5	36x4	36x7	I
Transport......15	1	1295	3¾x5	32x4½†	32x4½†	B
Transport......25	1½	1495	3¾x5⅛	34x3½*	34x4*	I
Transport......35	2	1885	3¾x5	36x3½*	36x6*	I
Transport......55	3	2385	4⅛x5¼	36x4*	36x8*	I
Transport......66	3½	2585	4¼x5½	36x4*	36x8*	I
Transport......75	5	3485	4½x6	36x5*	36x12*	I
Traylor.........B	1½	2390	3¾x5⅛	34x3½	34x5	W
Traylor.........C	2-2½	2850	4 x5½	36x4	36x7	W
Traylor.........D	3-3½	3300	4¼x5½	36x4	36x8*	W
Traylor.........F	5-6	4700	4½x6	36x6	40x6d	W
Triangle......AA	1	1285	3¼x5	34x4½†	34x4½†	I
Triangle........A	1½-2	1985	3¾x5¼	34x3½*	34x6*	I
Triangle........C	2-2½	2285	3¾x5¼	36x4*	36x6*	I
Triangle........B	2½-3	2535	4 x5¾	36x4*	36x7*	I
Triumph........G	1	1995	3⅝x5⅛	34x5†	34x5†	W
Triumph......HC	1½	2550	3¾x5¼	36x3½	36x5	W
Triumph......HB	2	2900	3¾x5¼	36x4	36x7	W
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3950	4¼x6	36x5	40x5d	W
[5]Twin City.....B	3½	....	5⅛x6	36x6	36x6	I
[5]Twin City.....A	5	....	5⅛x6	36x7	36x7	I
Ultimate........A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.......AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate........B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate......BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate........D	5	5500	5 x6½	36x6	40x12	W
Union.........FW	2½	3190	4 x6	36x5*	36x8*	D
Union.........HW	4	4650	4½x6	36x6	40x12	D
Union..........JW	6	5800	5 x6	36x6	40x14	D
United..........A	1½	2145	3¾x5¼	36x3½*	34x5*	W
United..........B	2½	3150	4¼x5½	36x4*	36x7*	W
United..........C	3½	3975	4¼x5½	36x5	36x5d	W
United..........V	5	4500	4½x6	36x6	40x6d	W
United States...U	1	1875	3⅝x5⅛	34x5†	34x5†	B
UnitedStates,NW	1½	2225	3¾x5	36x5	36x3½	W
United States...N	1½	1975	3¾x5	36x3½*	36x5*	I
United States...R	3	3075	4 x5¼	36x4	36x4d	W
United States...S	4	3875	4½x5½	36x5	36x5d	W
United States...T	6	4850	4¾x6½	36x6	40x6d	W
Velie...........46	1½	1585	3¾x5	36x3½	36x5	I
Veteran......M**	1½	2699	3¾x5¼	35x5†	35x5†	W
Veteran.......P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.......R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.......S**	4	5395	4½x6	36x5	36x10	W

*2-cyl †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. d—dual. All others solid. ††Price includes body. §—Price includes several items of equipment.

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Vim.....29	½	$1050	3½x4½	31x4†	31x4†	W
Vim.....30	½	1175	3½x4½	32x4½	32x4½	W
Vim.....31	1	1975	3¾x5½	36x5†	35x5†	W
Vim.....22	2	3150	3¾x5½	36x4	36x6	W
Vim.....23	3	3950	4¼x5½	36x5	36x5-1	W
Vulcan.....25	2½	4000	4¼x6	36x4	36x8	W
Vulcan.....25P	3	4500	4¼x6	36x6	40x8	W
Walker-JohnsonA	2	2500	3¾x5	34x5	38x7	W
Walker-JohnsonB	3	3500	4¼x5½	36x4	36x8	W
Walter.....S	5	4850	4½x6¼	36x6	40x6d	W
Ward-LaF.....2B	2½	2990	4⅜x5¾	36x4	36x4d	W
Ward-LaF.....4A	3½	3990	4½x6¼	36x5	36x5d	W
Ward-LaF.....5A	5	4590	5 x6¼	36x6	40x6d	W
Watson.....B	1	1635	3¾x5½	35x5†	35x5†	W
Watson.....N	3½	3825	4½x5½	36x5	36x10	W
Western....W1½	1½	2550	4½x5¼	36x3½*	36x5*	W
Western....L1½	1½	2550	3¾x5	36x3½*	36x5*	W
Western....W2½	2½	3250	4½x5¼	36x4	36x7	W
Western....L2½	2½	3250	4¼x6	36x4	36x7	W
Western....W3½	3½	4250	4½x6	36x5	40x5d	W
White.....15	¾	2400	3¾x5½	34x5†	34x5†	B
White.....20	2	3250	3¾x5½	36x4*	36x7	D
White.....40	3½	4200	3¾x5¾	36x5	40x5d	D
White.....45	5	$4500	4¼x5¾	36x6	40x6d	D
White Hick....E	1	1225	3¾x5	34x5†	34x5†	W
White Hick....H	1½	1375	3¾x5	36x3½	36x5	W
White Hick....K	2½	1675	4½x5¼	36x4	36x5	W
Wichita.....K	1	1875	3⅜x5¼	36x3½	30x4*	W
Wichita.....M	2	2400	3⅜x5¼	36x3½*	36x6*	W
Wichita.....RX	3	3200	4⅜x5¼	36x4*	36x8*	W
Wichita.....O	4	3500	4½x6¼	36x5*	36x5*	W
Wilcox.....AA	1	1900	3¼x5½	36x4*	36x4*	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3090	4¼x5	36x4*	36x3½d	*W
Wilcox.....E	3½	3950	4½x6	36x5*	36x5d*	W
Wilcox.....F	5	4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¾x5	30x3½	36x5	W
Wilson.....EA	2½	2825	4½x5¼	36x4	36x7	W
Wilson.....G	3½	3685	4½x5½	36x5	36x5	W
Wilson.....H	5	$4520	4¾x6	36x6	40x6	W
Winther.....751	1	1795	3½x5	34x4½†	35x5	I
Winther.....430	1½	2850	3¾x5	32x4	32x4	I
Winther.....39	1½	....	3¾x5	34x3½	34x5	I
Winther.....51	2½	....	4 x6	36x4	36x4d	I
Winther.....70	3½	....	4¼x6	36x5	36x5d	I
Winther.....450	2½	....	4 x6	34x5	36x6	I
Winther.....109	5	....	4½x6	36x6	40x5d	I
Winther.....140	7	....	5 x6	36x6	40x7d	I
Wisconsin.....A	1	1750	3¾x5	34x5†	34x5†	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	4 x5¾	36x6†	36x7	W
Wisconsin.....D	3½	3000	4¾x5¾	36x6†	40x8	W
Wisconsin.....E	5	3500	4½x6¼	36x6	36x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2250	3¾x5	36x3½*	36x5*	W
Witt-Will.....P	2½	2750	4½x5¼	36x3½*	36x7*	W
Wolverine.....J	1	2125	3½x5	34x3	34x4	I
Wolverine.....J	1½	2375	3¾x5	34x3½	34x5	I
Wolverine.....J	2	2640	3¾x5	34x4	34x7	I
Wolverine.....J	2½	3425	4½x5¼	36x5	36x10	I
Wolverine.....L	3½	4100	4½x5½	36x5	36x10	I

*2-cyl. †6-cyl. ‡8-cyl. All others, not marked, are 4-cyl. Trac., Tractor. **Canadian made.

Final Drive: W—Worm, I—Internal Gear, C—Chains, D—Double Reduction, B—Bevel, 4—Four-Wheel, E—External Gear. *Tires—optional. †Pneumatic Tires. d—dual. All others solid. ††Price includes body. §—Price includes several items of equipment.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chalm. B	6-12	$250	2	LeR.	4-3½x4½	Gas.	1
Allis-Chal.G.P	15-25	1350	4	Midw.	4-4½x5¼	Gas.	3
Allis-Chalm...	20 35	1885	4	Own	4-4¾x6½	GorK	3-4
Allis-Chalm...	20-35	2085	4	Own	4-4¾x6½	G,K	4
Allwork...2-G	14-28	1695	4	Own	4-4¾x6	GorK	3
Allwork...C	14-28	1395	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2510	4	Clim.	4-5 x6½	GorK	4
ARO...1921-22	3-5	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	2200	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	3420	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	4500	4	Own	4-7 x9	G,K,D	8-10
Automot. B-3	12-21	1785	4	Herc.	4-4 x5½	Gas.	2-3
Avery,SR.Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4½x6	G,K,D	3-4
§Avery.....	....	....	*	Own	4-4x5½	G,K,D	3
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4½	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule.H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule,.F	18-25	....	*2	Mid v	4-4½x5¼	Gas.	3
Bates Mule,.G	25-35	....	*2	Midw	4-4½x6	Gas.	..
Beeman,....G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	18-30	3100	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	5450	*2	Own	4-6½x8½	G,K,D	8-9
Boring...1921	....	1850	3	Wauk	4-4¾x5¼	GorK	2
Burn-Oil, 1922	15-30	1435	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1090	2	Own	4-4¼x6	Gas.	3
Case.....	10-18	700	4	Own	4-3½x5	GorK	2
Case.....	15-27	1320	4	Own	4-4½x6	GorK	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	GorK	4-5
Case....40-72	40-72	....	4	Own	7 x8	G,K,D	8-10
Caterpillar T11	25	3975	*2	Own	4-4¾x6	Gas.	4
Caterpillar T16	40	6050	*2	Own	4-6½x7	Gas.	6
Centaur.....	5-21½	385	2	N Way	2-4½x4½	GorK	1
Chicago....40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1315	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1590	3	Dom,	4-4¾x6	Gas.	3
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-It-All....A	3-6	595	..	Own	1-4½x5	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....F	16-30	....	4	Own	2-8 x8	GorK	4-5
E-B.....AA	12-20	1095	4	Own	4-4¾x5	G,K,D	3
E-B.....Q	12-20	750	4	Own	4-4¾x5	G,K,D	3
E-B.....	16-32	1750	4	Own	4-5¼x7	G,K,D	4
Fageol.....D	9-18	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse.B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar.....	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	395	4	Own	4-4x5	G,K	2
Fox.....E	20-40	2390	4	Own	4-5½x7½	G or K	4
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
Franklin....C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3-4
Franklin...G2	18-30	$1350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt...A	18-36	2150	4	Wauk	4-4¾x6¾	G or K	4
Gray.....1920	18-36	2000	3	Wauk	4-4¾x6¾	Gas.	4
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr..20	20	945	4	Own	2-5¼x6½	K,D.	2
Hart-Parr..30	30	1295	4	Own	2-6½x7	K,D.	3
Heider.....D	9-16	870	4	Wauk	4-4¼x5¾	G,K	2
Heider.....C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider....Cult	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light 4	12-25	1185	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4	15-30	1885	4	Midw	4-4½x6	Gas	3
Illinois, Super-Drive.....C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Imperial....E	40-70	4500	4	Own	4-7½x9	G,K,D	10
Indiana.....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International.	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	....	*2	Chief.	4-4¾x6	G,K,D	3-4
Lauson.....5	12-25	1495	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....20	15-25	1685	4	Beav.	4-4½x6	G or K	3-4
Lauson.....21	15-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Lauson Road.	15-30	2225	4	Beav.	4-4¾x6	K	..
Leader.....B	12-18	685	4	Own	2-6 x6¼	G,K,D	2-3
Leader.....M	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
Leader....GU	18-36	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn.....H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn.....W	60	5000	*	Wauk	4-5 x6¼	Gas	6
Little Giant,.B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant,.A	26-35	3300	4	Own	4-5½x6	K	6
Lombard.1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard.1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
Master Jr....	5-10	585		LeR.	-2⅜x4	Gas.	1
MerryGar1922	2	210	2	Evin	1-2⅜x2½	Gas.	..
Minne...All-P	12-25	900	4	Own	4-4½x7	G or K	3
Minne. Gen.F	17-30	1675	4	Own	4-4¾x7	G or K	3-4
Minne. Med.Duty	22-41	3000	4	Own	4-6 x7	G or K	5-6
Minne. HeavyDuty	35-70	4150	4	Own	4-7¼x9	G or K	8-9
Mohawk.1922	8-16	650	2	Light	4-3½x4½	K or G	1-2
Moline Univ D	9-18	990	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	990	2	Own	4-3½x5	Gas.	2-3
Motor Macult,	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	425	4	Own	2-3¾x4	Gas.	1
Nichols-Shep. 20-42.	20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep. 25-50	25-50	3000	4	Own	9 x12	G or K	4-7
Nilson Senior..	20-40	1975	5	Wauk	4-5 x6¼	G,K	4
Oil Pull.....K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull....G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	....	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	225	4	Own	1-5½x5½	Gas.	1
Oshkosh....M	6-12	650	2	Own	2-4 x6	G,K	1
Oshkosh....G	12-24	985	2	Own	2-6 x7	G,K	3
Peoria.....L	12-25	1600	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	$1750	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman....A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable.....	10-20	390	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4½x5¾	G or K	3
Russell.....	12-24	1500	4	Own	4-4½x5¾	G or K	2-3
Russell.....	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky,...J	10-20	1250	4	Own	4-4¼x5¼	G,K,D	2
Sandusky....E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk	4-3¾x5½	G or K	2
Steady Pull..	12-24	1485	4	Own	4-4 x5	Gas.	3
Stinson....4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Tioga.....3	15-27	1985	4	Wisc.	4-4½x6	Gas	3-4
Topp-Stewart....	30-45	....	4	Wauk	4-4¾x6¾	Gas.	3-4
ToroCultivator	6	750	3	LeR	4-3½x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR	4-3½x4½	Gas.	2
Townsend....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor	40-50	....	4	....	8-3¼x5	Gas.	4-5
Traylor....TB	6-12	715	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar....10	25-40	3750	*2	Wauk	4-5 x6½	G or K	4
Twin City....	12-20	1200	4	Own	4-4¼x6	G,K	3
Twin City....	20-35	2950	4	Own	4-5½x6¾	G,K	5
Twin City....	40-65	4750	4	Own	4-7¾x9	G,K	8
Uncle Sam C20	12-20	1385	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19	20-30	2300	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Utilitor....501	2½-4	295	4	Own	1-3½x4½	G	1
Vim.....B	15-30	1190	4	Wauk	4-4⅜x5¾	G,K	3
Wallis.....K	15-25	†995	4	Own	4-4¼x5¾	G,K	3
Waterloo...N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore21-22	12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2500	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin...E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin...F	20-40	2050	4	Wauk	4-5 x6¼	G or K	4
Wisconsin,..H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba....12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4½x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5½x7	D	..
Zelle.....	12-25	....	4	Buda	4-4¼x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. T.C.—Twin City. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. ‡Rodebilder. §Track Runner.